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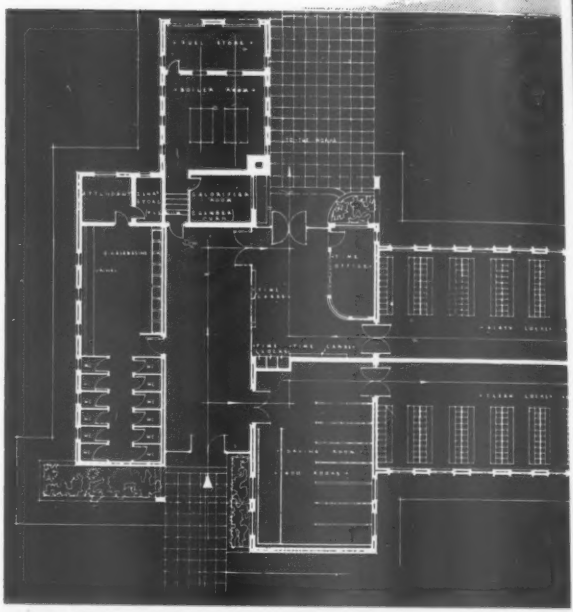

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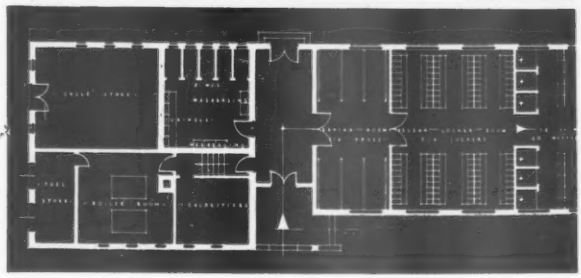

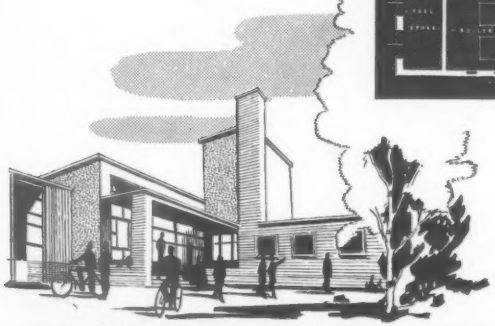

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Upsetting the Applecart

There are in front of us, two documents, one is an article in " Gray Iron News "—the organ of the (American) Gray Iron Founders' Society—on " Trade Associations," and the other " A Review of Productivity in the Bronze and Brass Casting Industry "—a British Productivity Council publication. The former, contributed by the Honourable Raymond Blattenberger designates trade associations as the key to intelligent competition. His philosophy is based on the notion that it has been found that collective intelligence is greater than the intelligence of any one of the individuals in a group. The inference suggested is " people working together." Towards the end of his contribution, Mr. Blattenberger, referring to the obvious benefits of association activities, points out that they are " not worth a dime if you don't use them." It would be imagined that the author was just an enlightened advocate of private business, yet actually he is the " Public Printer to the United States " which at least sounds like a public office, though this might not be the case.

Now the second document is of real interest, considered as a commentary on the first. Here, *inter alia*, is set out, by an independent and impartial body, just what has been done by the (British) Association of Bronze and Brass Founders. First of all, the Association sponsored the sending of a team to America to ascertain whether there was anything to be learned from that country. The team found they could gain much, and great efforts were made, not only to publicize the benefits to be derived from study of methods in America, but also to drill into non-ferrous founders the urgent need to implement the knowledge disclosed. There was first the very successful Harrogate conference, and later came the opportunity to add subsequent developments, such as the shell-moulding process, to the list of potential means of progress, plus a mutual-help scheme. A considerable—though still inadequate—measure of success has been achieved, as this new publication shows.

Whilst all this just relates to one section of the foundry industry, it can be applied to all and does show what "people working together " can achieve. To revert to Mr. Blattenberger's remarks, it is sad to think he still feared " ignorant competition " for an " unintelligent competitor can upset any applecart." By co-operation, many of the trade associations have built up during the years of the sellers' market, an *esprit* of progress, productivity and, incidentally, profits, all of which could be changed into stagnation and loss by some concern lacking proper knowledge of costs and good business tenets. The bankruptcy of one or a few concerns in any line of business weakens the financial structure of every firm in it—in fact it does " upset the applecart."

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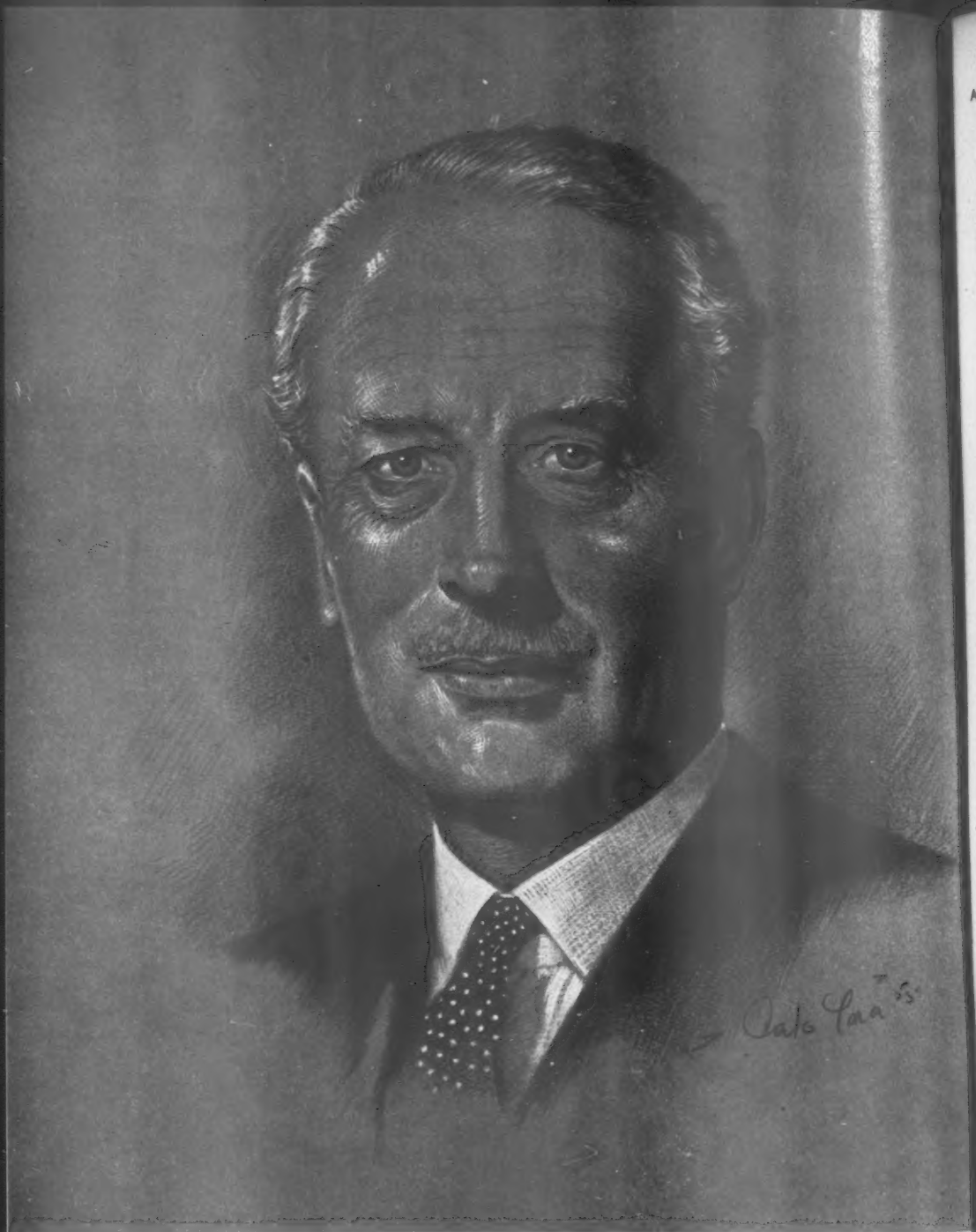


FRANCIS D. LEY, T.D., J.P.,

Managing Director of Ley's Malleable Castings Company, Limited

Leaders of the Industry

FRANCIS D. LEY, T.D., J.P.

FRANCIS LEY is the son of the late Sir Gordon Ley, Bart., and grandson of the late Sir Francis Ley, Bart., who started Ley's Malleable Castings Company, Limited, Derby, in 1874. He was born in 1907 and educated at Eton and Magdalene College, Cambridge, from which he holds an M.A. degree.

He joined the family business and, in 1928, spent six months in the United States studying methods of production in malleable foundries. His progress with the firm was rapid, for he was appointed general manager in 1935 on the death of Mr. Ian Panton; became joint managing director in 1939 and was made managing director of Ley's Malleable Castings Company, Limited, and chairman of Ley's Foundries and Engineering, Limited, in 1945, on the death of Sir Gordon Ley. He is also managing director of the Ewart Chainbelt Company, Limited.

Within his firm, Mr. Ley has pursued diligently the example set by his forebears, and this has included the fostering of happy relations with employees—over 50 years ago, Ley's gave holidays with pay and for 35 years they have had a profit-sharing scheme.

Mr. Ley takes a considerable share in public service in Derbyshire where he is a Justice of the Peace and chairman of Derby County Petty Sessional Division. Amongst other appointments he is vice-chairman of the Council of Ironfoundry Associations and chairman of the National Association of Malleable Ironfounders. He is also a member of the Worshipful Company of Founders, a Freeman of the City of London and a member of the Institute of British Foundrymen, attached to the East Midlands branch, which he joined in 1932. For recreation, Mr. Ley enjoys fishing, hunting and shooting.

I.B.F. Post-congress Tours

Programmes Arranged for Congress Delegates, June 26 to July 2

In last week's issue were published the detailed arrangements for the Congress week (June 19 to 25), arranged by the Institute of British Foundrymen (under the auspices of the International Committee of Foundry Technical Associations). In what follows, the programmes for the following week are given, to be spent in touring a large number of foundries in England and Scotland. Tour No. 1 is mainly confined to the Midlands and Lancashire, and Tour No. 2 to Scotland, the North East Coast and Sheffield. In each area, the local branch of the Institute is acting as host for a number of social functions and, of course, many of the firms themselves are providing hospitality. In all cases, too, complementary programmes for the ladies of the party have been arranged. It is assumed, of course, that the parties for the two tours will be chiefly made up of overseas delegates.

Tour No. 1

Sunday, June 26

11.10 a.m. Leave Paddington Station, London, for Leamington; luncheon on train; coach tour of Warwick and Shakespeare country (afternoon). Arrive Queen's Hotel, Birmingham, 6.00 p.m. approx.; dinner at hotel.

Monday, June 27

Coaches leave from Queen's Hotel for *one* only of the following works visits or groups of works visits:—

8.30 a.m. (1) Lloyds (Burton), Limited (morning) and F. H. Lloyd & Company's steel foundry at Wednesbury (afternoon); luncheon by kind invitation of the firm.

8.45 a.m. (2) (*a*) Sterling Metals, Limited, Nuneaton, and (*b*) British Piston Ring Company, Limited, Coventry (afternoon). Luncheon at the Leofric Hotel, Coventry. Tea by kind invitation of the latter firm.

9.20 a.m. (3) Austin Motor Company, Limited, Longbridge (all-day visit), luncheon and tea by invitation of the company.

9.20 a.m. (4) (*a*) W. & T. Avery, Limited's, new Tame Bridge foundry (morning), and (*b*) William Mills, Limited, Wednesbury (afternoon). Luncheon by kind invitation of W. & T. Avery, Limited.

Ladies—morning free.

12.30 p.m. Luncheon for Ladies at the Queen's Hotel, Birmingham. Coaches leave from the Queen's Hotel, Birmingham, for:—

1.40 p.m. ladies' visit to Cadbury Bros., Limited, Bournville. Tea by kind invitation of the firm.

7.00 p.m. to 7.40 p.m. Cocktail reception at the Queen's Hotel, Birmingham (by invitation of the Birmingham branch); (delegates and ladies).

8.00 p.m. to 11.00 p.m. Dinner at the Botanical Gardens, Birmingham; (delegates and ladies).

Tuesday, June 28

Coaches leave from Queen's Hotel for *one* only of the following works visits:—

9.20 a.m. (5) Bradley & Foster, Limited, Darlaston. Luncheon by kind invitation of the company.

9.30 a.m. (6) Midland Electric Manufacturing Company, Limited, Birmingham. Luncheon by kind invitation of the company.

10.30 a.m. Ladies proceed from the Queen's Hotel on foot for guided tour of Marshall & Snelgrove's fashion store, New Street, Birmingham.

12.30 p.m. Luncheon for ladies at the Queen's Hotel, Birmingham.

3.01 p.m. Depart by train to Nottingham (delegates and ladies). (Tea on train).

6.30 p.m. to 8.00 p.m. Cocktail party at the Victoria Hotel, Nottingham (by kind invitation of the East Midlands branch of the Institute). Return to respective hotels by coach for dinner. Evening free.

Wednesday, June 29

Delegates will proceed by coach on *one* only of the following visits:—

9.15 a.m. (7) Leys Malleable Castings Company, Limited, Derby (morning). Qualcast, Limited, Derby (afternoon). Luncheon and tea by kind invitation of the firms.

9.15 a.m. (8) Stanton Ironworks Company, Limited, near Nottingham (all-day). Luncheon and tea by kind invitation of the firm.

10.00 a.m. Coaches leave from respective hotels for:—Ladies' visit to Hardwick Hall. Luncheon and tea *en route*.

5.30 p.m. Delegates and ladies depart by coach from hotels for station for train to Manchester (dinner *en route*). Evening free.

Thursday, June 30

Coaches will leave from hotels for:—

9.30 a.m. (9) Works visit to Metropolitan-Vickers Electrical Company, Limited (morning), and Joseph Berry, Limited, Swinton (afternoon). Luncheon by kind invitation of Metropolitan-Vickers Electrical Company, Limited.

10.00 a.m. Coaches leave from respective hotels for ladies' visit to the Wedgwood Pottery Company, Stoke-on-Trent; luncheon *en route*. Return to Manchester at 5.0 p.m., delegates and ladies will dine at their own hotels.

6.45 p.m. Coaches leave from respective hotels for a theatre visit (delegates and ladies).

Friday, July 1:

Coaches leave from the respective hotels for:—

9.30 a.m. (10) Works visit to the National Gas & Oil Engine Company, Limited, Ashton-under-Lyne (morning) and Mather & Platt, Limited, Manchester (afternoon). Luncheon and tea by kind invitation of the respective firms.

10.00 a.m. Ladies' excursion by motor coach to Chester; luncheon in Chester; afternoon trip on the River Dee; tea in Chester; return to Manchester 6.00 p.m.

7.30 p.m. for 8.00 p.m. Informal dinner followed by entertainment; (delegates and ladies). (By kind invitation of the Lancashire branch.)

Saturday, July 2:

9.15 a.m. Depart Manchester by train for London (luncheon on train).

Tour No. 2

Sunday, June 26:

10.00 a.m. Leave Euston Station, London, for Glasgow. Luncheon, tea and dinner *en route*.

7.45 p.m. Arrive Central Hotel, Glasgow; evening free. (Note: delegates and ladies who prefer to do so may travel by air to Glasgow, leaving London at 5.45 p.m. and arriving Glasgow at 9.30 p.m.)

I.B.F. Post-congress Tours

Monday, June 27:

Delegates leave by motor coach for *one* only of the following groups of works visits:—

9.00 a.m. (1) Glenfield & Kennedy, Limited Kilmarnock (morning), and Renfrew Foundries, Limited (afternoon). Luncheon and tea by kind invitation of these firms.

9.00 a.m. (2) Glenfield & Kennedy, Limited (morning), and Babcock & Wilcox, Limited, Renfrew (afternoon). Luncheon and tea by kind invitation of the firms.

9.00 a.m. Ladies will leave for a motor-coach tour of the "Three Lochs." Return to Glasgow for luncheon at 1.00 p.m. at the Grosvenor Restaurant; afternoon free.

7.30 p.m. Dinner at the Grosvenor Restaurant; (delegates and ladies); (by kind invitation of the Scottish branch).

Tuesday, June 28:

9.00 a.m. (3) Coaches leave Central Hotel, Glasgow, for works visit to Wm. Beardmore & Company, Limited, Glasgow. Luncheon by kind invitation of the firm.

9.00 a.m. Ladies leave Central Hotel, Glasgow, for motor-coach excursion to Edinburgh; luncheon at North British Hotel, Edinburgh; afternoon free.

2.00 p.m. Delegates leave Glasgow for Edinburgh, and join ladies in Edinburgh on arrival.

4.00 p.m. Tea at the North British Hotel, Edinburgh (delegates and ladies).

5.14 p.m. Leave Edinburgh by train for Newcastle-on-Tyne (dinner on train); evening free.

Wednesday, June 29:

Coaches leave from the hotels, Newcastle-on-Tyne for *one* only of the following works visits:—

9.40 a.m. (4) C. A. Parsons & Company, Limited, Heaton Works, Newcastle-on-Tyne.

9.40 a.m. (5) R. & W. Hawthorn, Leslie & Company, Limited, Newcastle-on-Tyne.

Ladies—morning free.

12.15 p.m. 12.30 p.m. Luncheon at the Royal Station Hotel, Newcastle-on-Tyne; (delegates and ladies).

Coaches leave the Royal Station Hotel, for *one* only of the following works visits:—

1.40 p.m. (6) Jarrow Metal Industries, Limited.

1.40 p.m. (7) North Eastern Marine Engineering Company (1938), Limited. Tea by kind invitation of the companies.

1.45 p.m. Coaches leave Newcastle-on-Tyne for:—Ladies' motor-coach tour of Rothbury; visit to Cragside; tea *en route*.

6.00 p.m. Coaches leave from hotels for a visit to the Roman Wall at Chollerford and dinner at the Royal Hotel, Hexham-on-Tyne (dinner by invitation of the Newcastle branch); (delegates and ladies) return to hotels in Newcastle-on-Tyne.

Thursday, June 30:

9.15 a.m. Depart Newcastle-on-Tyne by train for Sheffield, luncheon on train.

2.00 p.m. (approx.) Coaches leave Grand Hotel, Sheffield, for:—

(8) Works visit to the Brightside Foundry & Engineering Company, Limited, Sheffield. Ladies—afternoon free.

7.00 p.m. Coaches leave Grand Hotel, Sheffield, for reception and dinner at the Royal Victoria Hotel, Sheffield (by invitation of the Sheffield branch).

Friday, July 1:

Coaches leave from the Grand Hotel, Sheffield, for:—

9.00 a.m. (9) Visit to the works of English Steel Corporation, Limited, Sheffield (morning) and Osborn Foundry & Engineering Company, Limited, Sheffield (afternoon). Luncheon and tea by kind invitation of these companies.

10.00 a.m. Coaches leave from the Grand Hotel, Sheffield, for:—

Ladies' motor-coach excursion to Haddon Hall; luncheon *en route*; tea at hotel.

4.50 p.m. Depart by train to London (dinner on train).

Nickel in Powder Metallurgy

Henry Wiggin & Company, Limited, Wiggin Street, Birmingham, have recently installed equipment for the manufacture of nickel and nickel alloys by the powder metallurgy technique. On their stand, No. 139, at the Radio & Electronic Component Manufacturers' Federation Exhibition, Grosvenor House, April 19 to 21, they will exhibit examples of the various forms in which these materials are produced as well as intermediate stages in the process. The powder-metallurgy process is applicable to the production of ternary alloys such as the nickel/cobalt/iron type similar to Nilo K for making glass-to-metal seals. The permeability of the magnetic nickel/iron alloys, when subjected to a standard heat-treatment at 1,050 deg. C., is critically dependent upon composition. As a result of the closer control possible by the powder-metallurgy process it is claimed that higher initial permeabilities can be attained compared with that of alloys produced by normal melting.

Precision Casting and the Gas-turbine

Precision casting is one of the developments which is growing up round the gas-turbine, Mr. James Hodge, chief consultant of the Government-owned Power Jets (Research Development), Limited, said in Birmingham on March 29. He was stressing that advances made in the development of the gas-turbine for aircraft could be adapted for industrial use. Those advances were freely available to the designers of industrial machines, Mr. Hodge said. By and large, the same technique could be used, and although there were two schools of thought, what was becoming more evident was that the industrial gas-turbine should be as much like the aircraft turbine as possible. There were now something like 200 large industrial gas-turbines in the world. In the development of the aircraft engine, many techniques have been developed which are of the greatest use to other industries—machining and precision casting amongst them, he added.

THE DEATH occurred on March 29 of Mr. WILLIAM JOWETT, of Bradford, at the age of 74. He was one of two brothers who founded the Jowett Cars organization in the early days of the century and was one of the few remaining links with the pioneer days of motoring in the West Riding, over half a century ago. He and his brother Bernard were joint proprietors of a pedal and motor-cycle shop in Idle, Bradford, and later began building their own engines for cars. This latter work was developed in their father's own engineering workshop in Back Kensington Street, Bradford, a couple of years before the start of the century. Their first effort was a small, air-cooled engine, and it was not until some time later that they went in for water-cooling. A remarkable three-cylinder engine was then produced which was fitted into a car in 1906.

Dust Dangers in Foundries

Difficulties in the way of devising an effective respirator to protect employees in foundries from the dangers of silica dust were focused in a dissenting judgment given by Lord President Clyde in the First Division of the Court of Session, Edinburgh. The division by a majority of two to one upheld a judgment of Lord Wheatley awarding £2,000 damages to John Harkness Wardlaw, steel dresser, of Lochend Road South, Edinburgh, who contracted pneumoconiosis while employed in the Leith works of Bonnington Castings, Limited. He sued the company for £5,000, and, after a proof, Lord Wheatley held that the company was responsible for his condition on a series of grounds.

Lord Clyde said the plaintiff operated a pneumatic hammer to remove excrescences from castings and his face was necessarily close to the impact of the hammer on the casting, which released minute particles of silica dust, so that he would almost inevitably inhale some of them. He was found to have the disease, which was a scarring of the lung tissues resulting from inhalation of the invisible particles, in May, 1950, after he had worked in the defendants' dressing shop for eight years. His Lordship said an effective mask would have prevented inhalation of the particles, but the evidence did not establish that there was any such respirator in existence in 1950, and certainly did not show that it was an "inexpensive precaution frequently adopted in the foundry industry."

It was clear the existence of an effective respirator, even in 1950, was not only not proved, but was negatived. Lord Wheatley had arrived at an opposite conclusion, but the evidence upon which he appeared to rely would not justify that conclusion. No ground of fault had been established against the defendants for failing to supply an effective respirator.

Pollution from Swing-grinders

It was also alleged that noxious dust escaped through the fault of the defendants from swing-grinders operated by other employees in the shop where the plaintiff worked, and that ventilation was defective. Lord Clyde held it proved that there was a failure in duty by the defendants in regard to the swing-grinders, but said that the dust produced by them was Carborundum dust, which was not a cause of pneumoconiosis. In his view the plaintiff had not established that his condition was due to the dust from the grinders, in respect of which alone fault against the defendants was proved.

Lords Carmont and Russell, while not supporting all the grounds on which Lord Wheatley proceeded, agreed with the conclusion which he reached. Lord Carmont said he did not think it would do for the defendants to say that it was much more likely that the disease was contracted when the plaintiff was working at his hammer in close proximity to a source of dust rather than from breathing the air of the shop which was generally contaminated.

Even if the majority of the plaintiff's inhalations took place near the source where the silica dust was produced, a minority from the general atmosphere of the shop—needlessly contaminated, owing to a breakdown of the extraction mechanism of the grinders—might well have contributed a quota of silica dust to the pursuer's lungs and so helped to produce the disease.

Lord Russell said the issue was a narrow one and

(*Continued at the foot of col. 2*)

was to be determined on a balance of probability which would support the conclusion submitted by the defendants that the swing-grinder silica dust was negligible and played no appreciable part in the inhalation affecting the pursuer. Having anxiously considered the evidence, his lordship was of opinion that the defendants had not succeeded in discharging the onus upon them.

Dinner

ALAR, LIMITED

The Ladies' Evening for the members and guests of ALAR, Limited, was held last week at the Trocadero, London, W.1. Mr. R. Hahn presided. "The Association" was proposed by Air-Commodore W. Helmore, C.B.E.; "The Guests" by Mr. F. Farenden, the latter being replied to by Mr. H. E. Thatcher, C.B.E. Amongst the guests were Mr. R. T. Priestman and Mr. R. D. Hamer, representing the Aluminium Development Association; Mr. V. P. Harries, C.B.; Mr. T. M. Wilson; Mr. L. J. Chandler and Mr. T. H. Hall of the Ministry of Supply; Mr. L. Fletcher, Mr. G. A. Rider, Mr. P. Fenn and Mr. W. D. Mendham representing the Light Metal Founders' Association and Dr. G. L. J. Bailey representing the British Non-Ferrous Metals Research Association. During an interval in the dancing period, the company was entertained by Mr. George Braund—a magician. The evening was faultlessly organized by Mr. Ross, the secretary of ALAR.

INSTITUTE OF METALS

The annual dinner of the Institute of Metals was held on March 31, at Grosvenor House, Dr. Maurice Cook presiding. At the high table were Sir Lawrence Bragg, The Hon. John Grimston; Sir Sydney Camm; (who were entrusted with speeches); Mr. G. L. Bailey; Mr. W. Barr; Dr. E. A. Bloch; Mr. R. G. Braithwaite; Sir Edward Bullard; Mr. J. C. Colquhoun; Prof. J. W. Cuthbertson; Dr. S. F. Dorey; Mr. F. Arnold Greene (master, the Worshipful Company of Founders); Dr. W. Hume-Rothery; Prof. W. O. Koster; Dr. B. Lunn; Dr. J. G. Pearce; Dr. L. B. Pfeil; Dr. H. G. Taylor; and Prof. A. von Zeerleder, most of whom were accompanied by their ladies.

Foundryworker Awarded £450

An action for personal damages was brought against Wilsons & Mathiesons, Limited, ironfounders, etc., of Leeds, at the West Riding Assizes Civil Court on March 25, by John William Kipling, labourer, of Greystone Street, Kirkstall Road, Leeds.

In November, 1952, Kipling was working as third man on the squeeze moulding machine. It was stated that when unhooking an empty moulding box from the overhead conveyer, he dropped it because it was very hot. It fell on to a full mould that was passing on the truck below and molten metal ran out of the full mould on to his boot which was set on fire and his foot was severely burned. He alleged negligence by the company.

Mr. Justice Slade said that he had no doubt that failure to provide a safe system of working led to the injury. He held there was no contributory negligence by Kipling, and he awarded general damages of £300, plus special agreed damages of £150.

IT IS REGRETTED THAT in the second list of contributors to the I.B.F. Congress Fund printed last week, the name of one firm, G. & R. Thomas, Limited, was wrongly printed as G. & N. Thomas.

Frozen-mercury Patterns for Ceramic Shell Moulds*

By Irvin R. Kramer†

Precision ceramic shell moulds made from frozen-mercury investment-patterns provide a way of forming complex shapes with close dimensional tolerances in both conventional and virtually unmachinable alloys.

A mercury pattern is made by simply freezing mercury which has been poured into a steel die. In freezing mercury, the same problem is encountered as in the solidification of nearly all molten materials, namely, that of feeding the casting to prevent shrinkage in undesirable places. The die is lowered into a dry-ice/acetone mixture at −100 deg. F. so that freezing will progress from bottom to top of the pattern. Since the rate of solidification is easily controlled by the rate of submergence of the die into the freezing bath, directional solidification, ensuring continuous feeding, is easily achieved.

When wax or plastic is used for investment-casting patterns, it is usually difficult to fill sections properly with thickness ratios greater than four or five to one. No difficulties are encountered when filling varying sections with mercury, as its high density causes it to fill the mould completely and reproduce the finest details of the die.

Perhaps the greatest advantage of frozen mercury as a pattern material for investment castings is its weldability which enables patterns to be made of complex shapes. When two pieces of frozen mercury touch with slight pressure, the pieces weld together. This ability for self-welding is exploited advantageously by employing booking dies to produce and assemble mercury patterns with complex internal passages and undercuts.

In principle, a booking die is composed of three sections, although in practice it may contain as many sections as are necessary to make a desired pattern. The die consists of two sections separated by a matchplate on which core details are placed. Mercury is poured into the cavities on either side of the matchplate, then frozen. The matchplate is removed and the two portions of the die are brought together and tapped lightly with a small rawhide mallet to ensure that the die sections meet. Large contacting surfaces are sometimes lightly scored before assembling, to ensure a good weld. The die is then opened and the assembled pattern removed (see Figs. 1 to 4).

Accessories Unnecessary

Alignment of the die is maintained by the use of precision die dowels; other accessory guide devices may be employed but are seldom necessary. This method of assembly-welding permits, along the parting line, registry limited only by tool-making accuracy. In the direction perpendicular to the parting plane no loss or gain of tolerance is encountered.

Self-welding properties are used to other advantages. Most castings made by this process are large enough to require patterns of gating and risering systems to be made individually. In these cases, the main portion of the pattern is frozen in the usual manner, while the gating and risering

* Reprinted from *American Foundryman*.

† The Author is vice-president of the Mercast Corporation, New York.

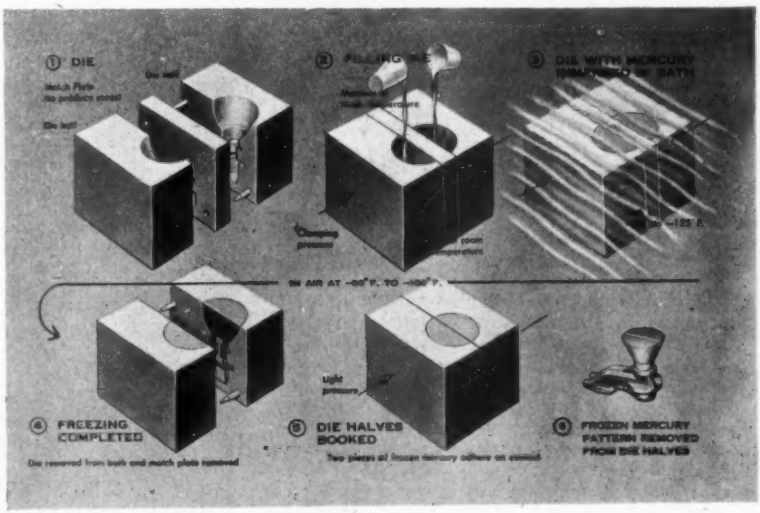

① DIE
Match Plate
Die half
Clamping pressure
IN AIR AT −60° F. TO −100° F.
Light pressure
④ FREEZING COMPLETED
Die removed from both end match plate removed
⑤ DIE HALVES BOOKED
Two pieces of frozen mercury adhere on contact
⑥ FROZEN MERCURY PATTERN REMOVED FROM DIE HALVES

FIG. 1.—*Sequence of operations necessary to form a complete one-piece frozen-mercury investment pattern.*

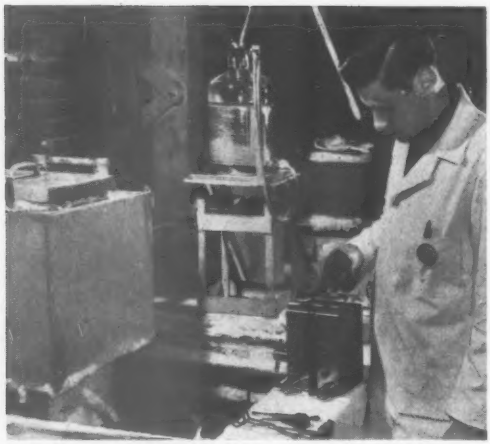


FIG. 2.—*Pouring mercury into a three-piece steel die. The die is then immersed in the freezing mixture (at −100 deg. F.).*

FIG. 3.—*Removing the matchplate prior to welding the pattern halves by re-assembling the die (note the die in the bath).*

system are frozen separately and joined by booking. Individual small mercury-patterns may be assembled easily by merely pressing them on to a common sprue.

Defects or fine lines that may result from booking are repaired by pouring liquid-mercury over the defect or smoothing the defect with a small knife or tool. The mechanical properties of mercury at processing temperatures are comparable to those of lead at room temperature. Mercury patterns are soft, ductile, and malleable, thus can be easily formed into a given shape. To repair damage to a mercury pattern it is necessary only to press a small amount of frozen mercury into the defect and smooth it into the general contour of the body of the pattern.

Large Castings

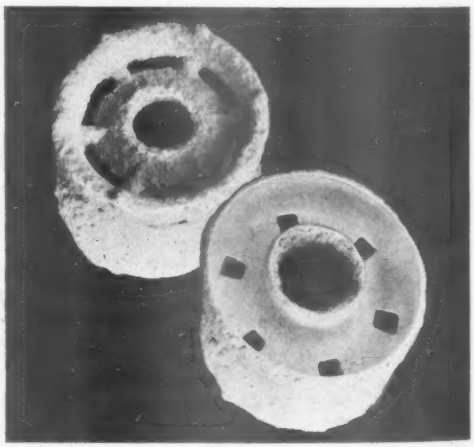
One important advantage of this process is that large precision castings can be made from frozen-mercury patterns, because mercury, at temperatures near −100 deg. F. is strong, possesses good creep-resistance, and has little volume expansion on changing from a solid to a liquid. Volume expansion of mercury on melting is 3.47 per cent.; expansion of waxes used in precision casting patterns is about 9 per cent. The small volume change which occurs during melting the mercury pattern from the ceramic mould produces little strain on the mould and permits large patterns to be used. Thus, the limits of size and section which are accepted for investment castings by other processes are not applicable to the frozen-mercury process.

Dimensions of castings in regular production in the wax process usually do not exceed 6 in. In some cases, however, patterns measuring almost 14 in. have been made using a combination of wax and plastic. Castings of this size are common in the mercury process, and castings of 42-in. dia. weighing over 300 lb. have been made in regular production.

Thin Ceramic Shell

Unlike other investment-casting methods, the frozen-mercury process employs a thin ceramic shell mould in which molten metal is cast. A shell $\frac{1}{16}$-in. to $\frac{1}{4}$-in. thick, sufficient to withstand the strains imposed in melting the pattern, is built up by dipping the mercury pattern into ceramic slurries kept at −80 deg. F. The shell is made by successively dipping the pattern into slurries of increasing viscosity, until the desired shell-thickness is reached (Fig. 5).

FIG. 4.—*Typical examples of ceramic moulds produced from mercury patterns.*



The first slurry, of very small refractory particles and very thin, imparts excellent surface-finish to the casting. A highly-volatile vehicle is employed in the slurries to dry the ceramic coatings at low temperatures in a very short time. Drying time is only a few minutes for the first coat because it is only a few thousandths of an inch thick. As the viscosity of the slurry increases, the drying time of the coating increases also.

Frozen mercury is extracted from the shell mould by simply running mercury at room temperature into the sprue or gate, like washing mud from a river bank. After most of the mercury has been washed out of the heavy sections, the mould is allowed to come to room temperature and the remaining mercury is poured out. Recovery of mercury is practically complete. Since volumetric expansion of mercury is small, it is not necessary to use much care in melting the pattern.

Although "green" moulds are fairly strong, it is usual practice to fire them soon after removing the pattern. It is not necessary to use an elaborate preheating procedure to prevent cracking or spoiling. "Green" moulds are placed directly into a furnace and held at 1,010 deg. C. (1,850 deg. F.) for about 2 hrs. They are then removed and allowed to air cool; again, it is not necessary to control the condition of cooling. Moulds may be stored at room temperature for an indefinite period and used when desired.

Since the ceramic shells are uniformly permeable, it is possible to employ suction-casting techniques (Fig. 6). For this purpose, moulds are placed in a flask containing loosely-packed material such as shot or coarse sand. A tight cover is formed of a layer of ceramic cement. When suction is applied to this system and metal is poured, uniform filling takes place. It is thus possible to cast sections of extremely thin cross-section without resorting to preheating of the mould. This is, of course, of great advantage in cases where grain-size control is important. Pressure or centrifugal casting-techniques can also be used, as well as suction.

Another advantage which accrues from thin shell moulds is in the removal of cores. Cores are broken by rapping the gate or sprue with a pneumatic hammer; fragments are then shaken out. Because the ceramic moulds are unreactive with molten metals, a large variety of metals has been cast with a minimum of trouble. Molten titanium will react with all known refractory materials, yet it has been cast successfully in ceramic moulds produced by the frozen-mercury process.

FIG. 5.—*A refractory shell is produced by dipping the mercury pattern into ceramic slurry and drying on side racks.*

FIG. 6.—*A thin, uniformly permeable shell-mould permits the use of pressure-, centrifugal-, or suction-casting techniques.*

Goggles

Leaflets received recently from Safety Products, Limited, 44, Hatton Garden, London, E.C.1, announce the use for the first time in this country of nylon in the making of goggles for grinders and welders. Through its use the weight is reduced in the case of grinders' goggles to 2¼ oz. For general use in the works there is another type carrying a bakelite laminated frame, with plastic-covered iron-wire side arms. The type of lens can be varied. This "Tough-spec" type weighs only 1¼ oz.

Flame Hardening

A two-day conference on flame hardening of iron and steel was organized in Essen, Germany, on March 29 and 30, by Paul Ferd. Peddinghaus. The programme, which was simultaneously translated into French and English, covered basic principles of flame hardening, methods of testing and control, and its use in the repair shop, giving practical examples. In studying the use of various gases in flame hardening, particular emphasis was placed on the recent introduction of propane and methane.

Correspondence

EXPANSION-TYPE SCABS

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—I would like to thank you for the extremely interesting article "Another Look at Expansion-type Scabs," printed in the JOURNAL, February 17, 1955. A ready-made answer not forthcoming, I venture to make the following points:—

(1) One observation recorded, was that in the case of the aluminium alloys this type of scab was not prevalent, I suggest the reason for this is the tubing or shelling effect, characteristic of these alloys, and also of all those containing any appreciable percentage of aluminium. The formation of the protecting oxide skin at the mould face promotes a chilling effect; it is reasonable to suppose this is also the case when the mould cavity has been filled with metal and, subsequently, a run-out has occurred, leaving a shell. (By "chilling effect" is meant the rapid cooling of the aluminium due to the relatively low insulating capacity of a green-sand mould face. At such a face, the shell of solid metal prevents penetration and veining.)

(2) The authenticity of the "hunch" is enhanced by the tendency to scabbing being worse in the case of the high-tin/phosphorus/copper alloys and the high-zinc/copper alloys. The fluidity of these alloys, coupled with the absence of a protective film and the high casting temperatures of the zinc/copper group give relatively increased risk of hot-spots, vein formation and subsequent scabs. Futhermore, it has been observed that these particular alloys are susceptible to extrusion of liquid from the top of a downgate, a considerable length of time after the mould has been filled, thus giving visible indication of a long solidification range.

(3) Regardless of the size of the expansion scab, it was recorded that the layer of sand separating the scab from the casting did not vary a great deal. I think the reason for this may be due to the compaction of the sand—the density and permeability of the sieved facing sand adjacent to the pattern differing from the backing sand. The thickness of this facing-sand layer (due to compression after ramming) is approximately the same as the layer of sand found between the scab and the casting.

(4) Conclusion: It is thus assumed that the scab is not formed until the mould cavity is filled, and results from the particular design of the mould, and the gating systems being such that hot-spots are formed. These, together with the other factors present (probably, for instance, the expansion of the sand face due to rapid heating), causes veining to occur to the depth of the facing sand—this being the forerunner of a buckle in the mould face a short period after the filling of the mould. As a result, the sand is forced (due to atmospheric pressure acting through the pores and vents of the backing sand) against the oxide film and metal skin. The fracture of this skin releases the liquid under pressure from beneath the oxide skin, thus forming the familiar-shaped scab.

Finally, as to the composition of the scab being different from that of the casting—as close resemblance is found between the scab metal and that recovered from the vent cavity of a core (which resulted from extreme veining and metal penetration), both examples constitute a bleeding effect prior to final solidification—the composition of the exuded metal consisting to a great degree of the low-melting-point metallic phases which may be present.

Theoretically, the sequence is thus:—Veining occurs comparatively early (probably during the pouring of the metal); a rupture takes place at a buckle in the sand to the depth of the sieved face very early after the mould has been filled, the fracture in the skin allowing partial formation of a scab; subsequently, bleeding of metal into the cavity occurs over a considerable temperature range, thus completing the scab.—Yours, etc.,

E. WOOD.

Wm. Rylance & Sons,
Warrington.
March 13, 1955.

ANTIQUE FOUNDRY

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—I enclose for your attention a catalogue concerning the sale (scheduled for March 24) of a small foundry at the village of Wickham, in Hampshire, that I feel may be of some general interest. This foundry appears to be a near-perfect example of the small rural foundry of the last century and is probably an almost unique example—at the present day—of a type of foundry that has long since disappeared from more industrialized areas.

The main foundry building is about 50-ft. square, brick built with a tiled roof and with the original oak timber-frame, uprights and roof-trusses. The cupola furnace occupies the centre of the building. It has a solid bottom, is about 2-ft. i.d., with the tapping hole in the breast and with two tuyeres with a wish-bone type of blast main. The furnace is steel-encased up to the charging platform. Above this, the uptake is entirely of brickwork and terminates in a rectangular outlet above the apex of the roof. The blowing engine is housed in a separate lean-to building at one end of the main structure, and appears to be a horizontal compressor, driven by an oil-engine (the writer could not get inside to examine it closely). The original blower may possibly have been water-driven, as the site of the foundry is adjacent to the small river Meon. There are two swing-jib cranes, of about 6 and 8 ft. radius, built, apart from the gearing, entirely of timber. They appear to be of the same age as the building and are museum pieces in themselves.

I understand that this foundry was working regularly up to about four years ago, when the goodwill of the foundry business and the loose plant and moulding-tackle was purchased by a firm in Fareham. From the scanty information I can glean locally, it appears that the foundry operated for well over a century—long before railways came to the south—and remains substantially in the form in which it was built.—Yours, etc.,

T. ALEXANDER.

Bitterne,
Southampton.
March 19, 1955.

Industrial Health and Safety Centre

Sir Walter Monckton, Minister of Labour and National Service has rechristened the Industrial Museum at 97, Horseferry Road, London, S.W.1, the Industrial Health and Safety Centre.

It is a permanent exhibition of methods, arrangements and appliances for promoting safety, health and welfare in industry. Unique of its kind in the country, many of the exhibits (which are lent by manufacturers) can be demonstrated in use. In addition to the general section, there is now a special exhibit in relation to the Iron and Steel Foundry Regulations.

Notes from the Branches

Newcastle-upon-Tyne

Through the courtesy of the directors of E. Jobling and Sons, Limited, nearly 80 members of the Newcastle-upon-Tyne branch of the Institute of British Foundrymen recently visited the Pallion Steel Works, Sunderland. On arrival they were welcomed by Mr. R. Elwen, director and general manager, and Mr. Clubley, assistant general manager. When receiving the members Mr. Elwen said that, as the works were operating, it would be more satisfactory to the visitors to wander about freely, and to concentrate on those sections which interested them most, asking any questions they desired.

General Layout

Formerly these works had an output of castings amounting to about 30 tons per week, but recent extensions to the works and plant have raised the output considerably and now it averages about 100 tons per week. The extensions include a new mechanized coreshop, manned by 12 operators and several apprentices, the shop being serviced by a new sand-conditioning plant. The cores as made are transported by a conveyor system to an Acme continuous drying oven. Although the majority of castings produced are small-to-medium-size, their production makes heavy demands upon the coreshop and careful organization is necessary to meet them.

A further extension is the heat-treatment shop which, at present, is equipped with a large furnace with water-quenching equipment at one side. A charger, operated electrically, moves on rails parallel with the furnace face and in addition to charging, removes the castings, when the heat-treatment is complete, and transfers them for quenching or other cooling. It is intended to instal oil-quenching equipment on the other side of the furnace and the foundation has been prepared to receive it. A charge was removed from the furnace and quenched while the visiting members were in the shop and it was noted that, before the quenching operation the chamber was automatically closed to prevent steam and fumes entering the shop.

Melting, Moulding and Fettling

Two electric-arc furnaces, each about 7 tons capacity, supply the molten metal, and it was noted that the metal tapped was very fluid, indicating the firm's preference for high-temperature metal to ensure easy running. Although hot metal is preferred it, is noteworthy that no dressing is applied to the green-sand moulds other than the facing sand, yet the skin produced on the castings was excellent. The bulk of castings produced are in several grades of carbon-steel, but low-alloy steel castings are also produced, involving the use of chromium, nickel and molybdenum.

While the visitors, who were mainly ironfounders, found much of general interest, special attention was paid to the method adopted at these works to reduce the work involved in removing risers from the castings. As is well-known, large risers are almost invariably necessary with steel castings so that the casting can be fed as the metal poured into the mould shrinks. These risers usually present a costly removal problem in the fettling shop, especially as the contour of the casting frequently has to be formed after the riser has been removed with a flame cutter. At these works the cross-sectional area of the riser adjacent to the mould is considerably reduced by the use of a core, which carries a knife-edge aperture through which the metal is fed. The thickness of the core used and the size of the aperture are dependent upon the size of the riser and the thickness of the metal in the casting; cores were shown which varied in thickness from ¼ to 1 in.—the larger the riser, the thicker the intervening core. By this method the core can be made to follow the contour of the casting, apart from the orifice through which the casting is fed, and the heat in the riser maintains the neck of metal connecting with the casting in a fluid condition long enough to feed the casting properly. In the fettling shop many of the risers treated in this way can be safely removed with a blow or two from a hammer, in any case, if the oxy-acetylene flame is necessary, the time required to cut through the nicked riser is only a fraction of that necessary to cut through the full riser section. Members were assured that the adoption of this method had not only effected great savings, but had made possible a throughput of 100 tons of castings per week. Without knock-off risers, the fettling shop would have been seriously congested.

Vote of Thanks

After doing full justice to a very good luncheon provided for the visitors, MR. C. W. STEWART, president of the branch, spoke very feelingly of the manner in which members had been received at the works and felt sure that everyone had enjoyed the visit immensely. On behalf of members he asked Mr. Elwen to accept and convey to his fellow directors their very best thanks for the courtesies extended to them; he also included the departmental heads, who had been so attentive to the questions of members as they moved through the works. His vote of thanks, which was seconded by Mr. Elsdon, was heartily supported by the members.

British Industries Fair

The British Industries Fair is to be held at two different times of the year from 1956 onwards. The first show will be at Earls Court, London, from February 22 to March 2. The second will be at Olympia, London, and Castle Bromwich, Birmingham, from April 23 to May 4.

Mr. Kenneth Horne has been appointed full-time managing director of the Fair. He is at present one of the six directors of British Industries Fair, Limited, the company formed last year to take over the Fair from the Board of Trade and to promote it as a commercial undertaking. Mr. Horne will give up his position as sales director of Triplex Safety Glass, Limited, where he has worked for 27 years. He will take over his new job after this year's Fair from the present general manager, Mr. J. L. Reading, who directed the two previous Fairs and was loaned by the Board of Trade to help the new company in its first year.

The Earls Court section of the Fair in February will be for consumer goods such as toys and games, textiles and clothing, fancy goods, jewellery, stationery, leather and sports goods, for which the main selling season is in the spring. Olympia will cater in May for exhibitors from other lighter industries such as packaging, chemicals and office appliances, and Castle Bromwich for heavier industries such as engineering and hardware. The changes may involve some adjustment between the industries showing in London and Birmingham.

THE SIGNATURES of the Queen and the Duke of Edinburgh have been stolen from the distinguished visitors' book at the factory of Rolls Royce, Limited, Derby.

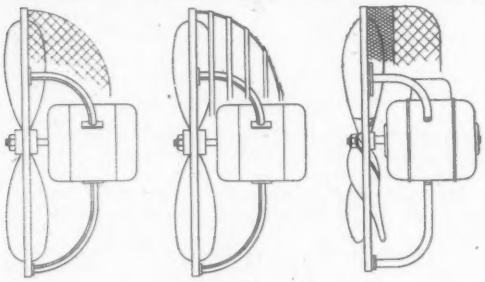
New Equipment

Fan Guards

In view of the statutory requirements associated with section 14 of the Factories Acts, 1937, which deals with fencing of dangerous parts of machinery, it becomes essential for fan manufacturers to adopt a more realistic approach to the question of guarding propeller fans. Generally speaking the designs of guard for the purpose have been influenced largely by the necessity of avoiding the possibility of seriously impairing the volumetric output or increasing the air noise whilst, simultaneously, giving some reasonable protection against accidental contact.

From recent experiments carried out by Keith Blackman Limited, Mill Mead Road, Tottenham, London, N.17, it has been found possible to produce a simple and highly effective guard which complies first with the all-important safety factor and yet offers no great restrictions to air-flow and does not create additional air noise. This design of guard is now fitted as standard to the firm's new range of APA-type fans.

The accompanying diagrams, Figs 1 and 1(*a*), illustrate two of the orthodox types of guard often supplied to-day and it is apparent that the section of the guard immediately adjacent to the fan ring provides inadequate protection against this danger, or "vulnerable" zone. Fig. 2 shows the new type of guard, where it will be seen that the "vulnerable" zone is now formed cylindrically and protected by a much closer wire mesh.



1 1*a* 2

FIGS. 1 AND 1*a*.—*Orthodox types of fan guard; and* FIG. 2—*new design introduced by Keith Blackman, Limited.*

The construction of the guard is such that it is impossible to make accidental contact from either the peripheral or previously referred to "vulnerable" zone. In the design of all these fans, special fixing-plates are incorporated with the fan ring, so that the new guard may be fitted, quite simply, whether ordered at the same time as the fan or at a later date.

Moisture Meter

A new method has been devised by J. L. Shaw, of Shaw Electronics, 31 Market Street, Bradford, using modern circuitry and very-high-frequency radio radiation, to determine accurately the di-electric or propagation constant of a material—which is directly related to the moisture content. This has been adapted in the instrument shown in Fig. 3, which can be used for testing moisture, from 0 to 100 per cent., in a variety of materials, including foundry sand. The meter weighs only 10½ lb. and is of overall size 10 by 10 by 10 in. The test cell takes a sample of a few grammes or more and

FIG. 3.—*Shaw electronic moisture meter, which can be used with any normal a.c. electricity supply from* 210 *to* 240 *v.*

is provided with a plastic rammer for checking the calibration. There are only four controls apart from the main switch, namely "tuning" knob, correction, fine adjustment and six-position switch, to cover a series of ranges of moisture contents.

Refractory Coating

The high cost of replacing the refractory linings of furnaces, together with the cost of lost production time has led to the development of a number of materials which can be applied as a surface coating and have as their object the production of a monolithic refractory surface. The surface so produced having higher-grade refractory characteristics than the untreated brickwork gives a longer working life than could normally be expected from the grade of firebrick used. These refractory coatings retard spalling which occurs as a result of either thermal shock or acid attack. A new product of this nature is "Dohmseal" made by Mellor Mineral Mills Limited, of Etruria Vale, Stoke-on-Trent, a firm whose history goes back to 1792. It is claimed that the new refractory coating will retard the action of corrosive gases and of temperatures up to 1,200 deg. C. The material, which is air drying, is supplied as a paste for mixing with water to form a slurry to be applied with a brush. It can also be used for jointing when mixed with clay grog and produces effective repairs of broken brickwork. The cost per application of this coating is of the order of 7s. 6d. per sq. yard of surface.

Pearlitic Malleable Iron

The American Society for Testing Materials announces higher specified strength values for pearlitic malleable iron recommended by ASTM Committee A-7, which range from 65,000 lb./sq. in. (29 tons) tensile strength with 45,000 lb./sq. in. (20 tons) yield point and 10 per cent. elongation, to 100,000 lb./sq. in. (45 tons) tensile strength with 80,000 lb./sq. in. (36 tons) yield strength and 2 per cent. elongation. Intermediate grades are included. These new values would tentatively replace those now contained in the Standard Specification for pearlitic malleable iron castings (A 220).

Nodular Cast Iron*

Present Position and Future Prospects as an Engineering Material, with Special Reference to Suitability for Crankshafts

London Discussion of the Paper by S. B. Bailey, M.Sc. (Eng.), M.I.Mech.E.†

[SLIGHTLY ABRIDGED]

(*Continued from page* 354)

In this concluding section of the discussion, the Author comments on the relative costs of raw-material in the light of Mr. Braidwood's remarks and the new disclosures on the availability of mischmetall. He considers calender rolls to be a natural outlet for nodular iron and sees no insuperable difficulty with rubber bonding. The discussion comments on crankshafts are replied to point by point, covering such points as unnotched fatigue, rolling of fillet radii, costs and heat-treatment. On machining, results had proved disappointing, the Author states, and for brake-drum material flake-graphite iron had shown itself superior. Other topics include a volute casting; service of nodular iron at high temperatures; boundary lubrication and wear, and ploughshare manufacture. Finally, in an appendix, additional information is given regarding the variation of impact resistance of nodular irons with temperature.

Raw Material Costs

He was grateful to Mr. Braidwood for pointing out the cost reductions which could be effected by using scrap steel in the manufacture of nodular cast iron. Mr. Braidwood's cost comparisons seemed perfectly sound, and it was evident that the use of steel scrap instead of low-phosphorus pig-iron could yield treated metal in the ladle at much lower costs than those quoted in the Paper: possibly below £20 per ton for material produced in acid cupolas, and below £15 per ton for material produced in basic cupolas. He wondered whether the steel scrap was available in the necessary quantities; the Metal Bulletin dated October 1, 1954, stated (p. 23), "The supply position for short, heavy steel scrap for foundries remains very difficult in spite of merchants' efforts." Steel scrap was most easily supplied by the merchants to the biggest user—the steel industry—and its price was controlled by statute. In those circumstances, he wondered what incentive the iron-founder could offer to the merchant to forsake his well-established market. Unless those circumstances changed—and it seemed unlikely that they would—he still considered that the production of large quantities of cheap nodular cast iron would be dependent on the ready availability of cheap low-phosphorus pig-iron.

He did not remember having suggested that such failures of the nodulizing processes as had occurred in industry could be attributed to the originators of those processes. He was quite sure that the precise metallurgical control required by both the cerium and magnesium processes was fully appreciated by the inventors of those processes: but he was by no means sure that it was fully appreciated by the whole of the ironfounding industry.

His figure for the amount of cerium mischmetall necessary in the supplementary addition process had been derived from Morrogh (1952). He had quoted the smallest percentage of mischmetall which Morrogh had used in his experiments and which had consistently produced a nodular structure in iron from contaminated melts. He was glad to hear that even less mischmetall had been found necessary in commercial practice, though the difference between 4 oz. per ton and 8 oz. per ton would have an almost negligible effect on the cost of the castings produced. It would be more important to the mischmetall producers, who would only be called upon to supply 10 tons for every 100,000 melt tons of nodular cast iron, instead of the 20 tons which the Paper might have led them to believe.

When the general rate of application of scientific research results in American industry was compared with that in Great Britain, he did not consider it was scornful to say that it would be optimistic to expect the percentage output of nodular-iron castings in the United Kingdom in 1953 to equal that in the United States in 1952. In his opinion, it was only necessary to consider the relative rates of taxation on individual income in the United States and in the United Kingdom to realize why the former country had usurped Britain's position as the land of pioneers in industry; in his opinion, the spirit which led

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* Paper presented to the Institution of Mechanical Engineers and printed in the JOURNAL, May 20, 27 and June 3, 1954. Other discussion contributions were printed in the JOURNAL, February 24, March 3, 10, 24, and 31, 1955.

† The Author is on the staff of Intelligence Division, London Headquarters, Department of Scientific and Industrial Research.

individuals to try their hands at something new and unproven could be killed by high taxation. Mr. Braidwood was concerned with the comparison of progress in Europe as a whole with progress in the United States: he was more concerned with progress in the United Kingdom as compared with progress by competitors elsewhere in Europe. It seemed significant that Mr. Braidwood had not thought fit to give the United Kingdom production figures for nodular cast iron.

Calender Rolls

In reply to Mr. Young, he understood that nodular-cast-iron rolls for steel mills had already been produced in Britain with as-cast weights up to 20 tons, and, on the Continent, up to 47 tons. He could see no reason why nodular-cast-iron calender rolls should not be produced, and he would advise him to get in touch with the British Rollmakers' Association to find a firm which would undertake the job.

The difficulty of bonding rubber to metals was a function of the surface porosity of the metal. Flake-graphite grey cast iron was a very difficult material, because it was almost impossible to remove pickling liquor from the graphite-filled cracks which ran everywhere across its surface. If cutting lubricants were used during machining, the problem became even more difficult. The surface porosity of nodular cast iron was very much less than that of flake-graphite cast iron, as would be evident from the microstructures, and he would expect nodular cast iron to be an easier material for rubber bonding. He had been unable to find anyone who had tried to bond rubber to nodular cast iron, but he would have thought that if one machined it dry, and then blasted the surface with very fine abrasive to remove as much of the exposed graphite as possible, there would be little difficulty in obtaining an adherent brass film which would survive the vulcanizing temperature. There appeared to be a need for research in that direction.

Nodular cast iron should be quite suitable for hydraulic cylinders for platen presses, and he knew that it was already being used for tyre moulds with complete success, but not without considerably increased cost.

He was pleased to find in Mr. J. E. Russell someone who considered that he had succeeded in being impartial. He did not share Mr. Russell's view that the notched reversed-bending fatigue strength of nodular cast iron was no better than that of flake-graphite cast iron: the results given in Fig. 12 and Table III refuted that. What he did suggest was that the best nodular cast irons might not be much better than the best acicular flake-graphite cast irons in notched torsional fatigue strength, and he very much regretted that, so far as he could discover, no research on the subject was at present in progress in Britain.

Crankshaft Fatigue

In reply to Mr. Love, he had purposely omitted any curves showing unnotched fatigue strength because unnotched fatigue strength was of such little interest to the design engineer: in fact, it could be dangerously misleading. The very nature and shape of a crankshaft resulted in its being a large notched-fatigue test-piece, and nothing the designer could do would alter the fact. Unnotched fatigue strength might be of importance to metallurgists and physicists seeking the scientific explanation of the cause of fatigue, but the Paper had not been written with them in mind. It was because the fatigue tests on small specimens did not give any indication of scale effect that he had included Table III giving the results of tests on complete crankthrows. It was good to know that there had been an opportunity to compare the fatigue strengths of cast-iron and forged-steel shafts of similar size, but without a knowledge of the basic design features of the shafts concerned, Mr. Love's findings would not be of much use to other research workers: if the fillet radii were unusually large, the steel shaft would appear better than it ought, and vice versa. If he had stated the crankpin diameters, the web thicknesses, the fillet radii, and the nominal fatigue strengths, Mr. Love would have added to the value of Table III. He hoped it would be found possible to publish that information on some future occasion.

Cold Rolling of Fillets

He agreed with Mr. Love's remarks about the cold rolling of the fillets between the webs and the journals and crankpins. His (Mr. Love's) work at the Motor Industry Research Association had proved that great increases in fatigue strength could be obtained in the laboratory in that manner, both with steels and with flake-graphite irons. The increase was to be expected with steels, but he had to confess that he was surprised to see that cold rolling had been equally effective on a pearlitic flake-graphite cast iron.

Later work by Gilbert (1954)* had shown that cold rolling the groove root radii on Wöhler specimens of the sizes covered by Table II and Fig. 12 could give up to 20 per cent. increase in notched fatigue strength with pearlitic flake-graphite cast irons, 110 per cent. with ferritic flake-graphite cast irons, 140 per cent. with pearlitic nodular cast irons, and 190 per cent. with ferritic nodular cast irons. A 45.3-ton pearlitic nodular cast iron, cold rolled at the optimum roller load, had a notched fatigue strength of ± 30.4 tons per sq. in., a figure which was 50 per cent. greater than the best shown for any unrolled material in Fig. 12. The response of nodular cast irons to cold rolling being so very much better than that of pearlitic grey cast irons, it was to be hoped that Mr. Love's tests on rolled fillets on full-scale crank throws would be extended to the former materials. Whether cold-rolled fillets were economic on the mass-produced automobile-engine crankshaft, which was likely to be one of the first crankshafts selected for shell moulding in nodular cast iron, had yet to be proved, for the cold-rolling

* Gilbert, G. N. J., 1954, "Influence of Surface Rolling on the Fatigue Properties of Flake-graphite and Nodular-graphite Cast Irons," British Cast Iron Research Association, Research Report No. 392, BCIRA *Journal* of Research and Development, **5** (No. 8), 447.

process involved another operation after the shaft had been cleaned following grinding. Rolled fillets might be attractive to the aircraft-engine manufacturer and to the racing-car manufacturer, because the gain in fatigue strength was large compared with the cost, and it cost nothing in weight.

In his opinion Mr. Love's plea for an increase in the fillet radius on the cast crankshaft to improve its fatigue strength relative to that of the forged shaft was a case of special pleading. Flake-graphite-cast-iron shafts were not much improved by large fillet radii; steel shafts and nodular-cast-iron shafts were greatly improved. The designer could not usually afford to use much larger fillet radii than he did already, because to accommodate them he had to steal space either at the expense of web thickness or of big-end and main-bearing length. The whole design was a compromise, but it was not to be expected that the nodular-cast-iron shaft would receive special treatment where fillet radii were concerned.

There was little information available on the relative rates of wear of nodular-cast-iron and steel journals, but the experience of the American manufacturer mentioned in the Paper and of Mr. Adamson seemed to indicate that nodular cast iron was quite satisfactory. He would not expect it to be as good as flake-graphite cast iron in reciprocating sliding, but he saw no reason why it should be inferior under the conditions prevailing in an automobile engine journal or crankpin bearing.

Crankshaft Costs and Heat-treatment

Mr. Adamson's communication contributed extremely useful information in the economic field, and he (the Author) owed him and his company a great debt in coming to his aid with some original data on relative costs. Information of that kind was extremely difficult to obtain when one was neither a manufacturer nor a buyer of a new material. Unfortunately, many research workers seemed to consider that costs were the last thing they should be concerned with: but the engineer could not adopt that attitude. The manufacturing costs were just as important to the engineer as were the mechanical properties.

He did not see how failure under a static proof load only 50 per cent. of the normal breaking load could be caused by brittleness. It seemed to him more likely that the improved results after quenching and tempering were due to stress relief rather than to the increased ductility obtained. If the properties of the material eventually selected had been as stated by Mr. Hallett, the ultimate tensile strength would be 50 tons per sq. in. He would estimate the notched torsional fatigue strength of such a nodular cast iron in the size quoted to be about ± 7.5 tons per sq. in., giving an ultimate fatigue-stress range of 15 tons per sq. in. at zero mean stress. He assumed that the stress figures given by Mr. Adamson were the mean shear stresses at the surface of the crankpin (neglecting stress-concentration effects) as calculated from torsiograph measurements on an engine. The stress range quoted (just over 5 tons per sq. in.) was very small compared with the ultimate fatigue-stress range of 15 tons per sq. in. which the material should be capable of withstanding at a mean stress of $2\frac{1}{2}$ tons per sq. in.: that might explain why the shafts had given no trouble. He would have thought that a grey-cast-iron shaft would have provided all the strength which was really necessary in that application, unless the bending loads on the crankshaft arising from gas and inertia forces were too high to permit the employment of a material of lower tensile strength. Although it was true that nodular cast iron had proved as good as forged steel in that particular instance—because shafts in neither material had given any trouble in service—it must not be overlooked that the steel shaft in the engine concerned might have a very high margin of strength over that which was really necessary. If the output had been doubled, one shaft might have survived and the other failed.

Mr. Adamson's experience that, with the nodular-cast-iron shafts, the surface hardness had little influence on the rate of wear, was interesting; but from Mr. Hallett's figures, the surface hardness only varied between 270 and 310 Diamond pyramid number, which would not be sufficient to make a lot of difference. He had been concerned more with variations down to the 120 Brinell of a soft ferritic nodular cast iron, up to the 600 Diamond pyramid number given by flame hardening a pearlitic nodular material.

Machinability

The poor machinability of pearlitic nodular cast iron had been noted in the United States (Le Grand 1951)† but he had been quite unable to persuade any research organization in Britain possessing the necessary facilities to do any work in that field. In order to form an independent opinion, he had had to try machining the material on his own lathe at home, where he had no facilities for grinding carbide-tipped tools and had to be content with high-speed steel. However, the results confirmed Mr. Adamson's experience: tool wear was very rapid at cutting speeds which gave no trouble with steel. The American tests—which had been more scientific than his own—showed that as-cast nodular iron was little better than acicular flake-graphite cast iron where the limiting cutting speed for identical tool wear and metal removal was concerned. However, he could confirm the American finding that pearlitic nodular cast iron was easier to drill than cast steel. Ferritic nodular cast iron was, of course, one of the easiest materials to machine.

Mr. Brown would understand from the above remarks why there had been so little reference to machinability in the Paper. Mr. Adamson had corrected that, and the information he had given would be more than sufficient for most people. It was unreasonable to expect high wear resistance from ferritic nodular cast iron, and it was unfortunate that it could not be flame or induction hardened satisfactorily. It could probably be nitrided, but that might be much more expensive.

† Le Grand, R., 1951, *Machinist*, **95**, 101, "Machinability Depend on Microstructure."

Nodular Cast Iron—Discussion

The reason he had made no mention of nodular cast iron as a brake-drum material was that he knew it had been tried and found to give inferior results to flake-graphite cast iron in that application. There was no point in advocating its use where a cheaper material would serve better.

The fact that curves were drawn for all the cast materials in Fig. 12 did not mean that there was no scatter. There was considerable scatter, but in each instance there was no difficulty in deciding where the mean curve should lie, and there seemed to be a reasonably definite relation between ultimate tensile strength and notched fatigue strength. There might have been a far better relation with the wrought steels, had the stress-concentration factors for the notches been as low and as uniform as were those for the other materials.

He would not be so certain as Mr. Brown that surface hardening would increase the notch sensitivity of nodular cast iron, for it did not usually have that effect with steels, the result being complicated by the compressive stress induced in the surface layers. For further information he would refer him to the excellent survey which had been prepared by Love (1950)*. His experience with induction and flame hardening of ferritic nodular cast iron was similar to Mr. Brown's. He fully agreed with Mr. Brown on the subject of nomenclature, and was glad to have his support; he had dealt with that matter in greater detail in his reply to Dr. Everest.

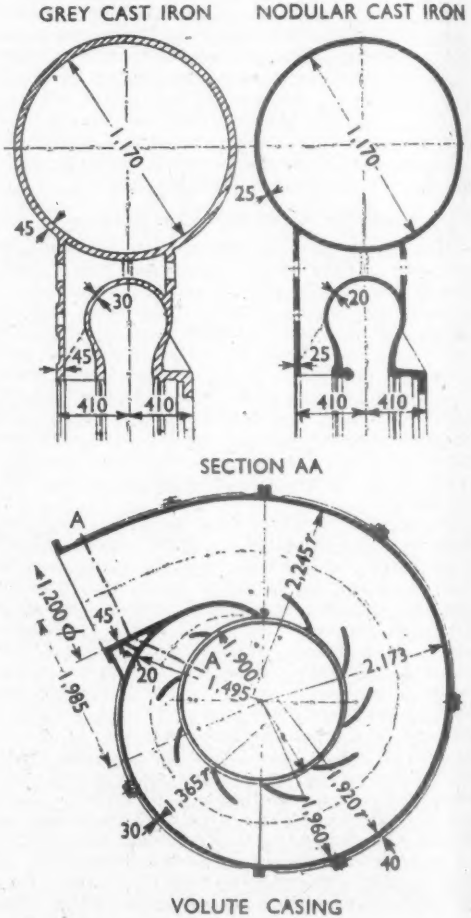
Mr. Kennedy's statement that cerium mischmetall could be supplied at 24s. 0d. per lb. when substantial quantities were involved was most welcome, as was any other news of developments which would tend to bring down the cost of making nodular cast iron. However, the cost of the mischmetall was not an important factor in the total production cost: the important factor was the cost of the nickel which was at present used. The world demand for nickel was likely to grow rather than diminish. If the price of cerium mischmetall continued to fall as rapidly as Mr. Kennedy's figures implied and the demand for nickel continued to exceed the supply, the cerium process might one day be cheaper than the nickel/magnesium process, and one might then hear of the addition of small quantities of magnesium/nickel alloy to cerium-treated iron to reduce sensitivity to section size and sulphur content!

Volute Casing

In reply to Mr. Quayle, the drawing of the volute casing was reproduced in Fig. H. It was taken from Stauffer (1953) and it demonstrated that large shells of thin section could be satisfactorily cast in nodular iron and that it was therefore possible to take advantage of the high strength of the material by using less of it. Where rapid changes of section were concerned, he would not consider that nodular cast iron would permit much relaxation of the design limitations imposed in steel castings; those limitations arose from high solidification shrinkage which was still present with nodular cast iron. He hoped the work which was being done at the British Cast Iron Research Association and at the College of Aeronautics, on the properties of nodular cast iron at elevated temperatures, would soon enable Mr. Quayle to be provided with the design information he needed.

He fully agreed with Mr. Twigger that the discovery of a process, by which the graphite in as-cast iron could be persuaded to form in lumps instead of in flakes, was extremely valuable, and it was because he shared that view that he was most anxious that the British pioneers originally responsible should be given the credit, and the original British name for the product retained.

FIG. H.—*Water-turbine volute casing (dimensions in mm.).*



* Love, E. J., 1950, Motor Industry Research Association Report No. 1950/9, "The Fatigue Strength of Steels—A Survey of Information" (reprinted in *Automobile Engineer*, January, 1952, 35).

Boundary Lubrication and Wear

Pearlitic nodular cast irons had much the same hardness range as pearlitic flake-graphite cast irons and when run dry against iron or steel, they had similar wear resistance. However, under boundary-lubrication conditions, nodular cast iron rubbing against steel might be expected to have poorer wear characteristics than flake-graphite cast irons, simply because the latter had the more porous surfaces and could retain more lubricant. That was confirmed by the results given by Mr. Brown earlier. A nodular-cast-iron piston ring, operating in a flake-graphite-cast-iron cylinder, might perform very satisfactorily because the porous surface would then be provided by the cylinder walls. The Russians appeared to be making some use of the material in that application if one could judge from one of their recent textbooks (Sukhodol'skaya 1953)* in which the author quoted greatly reduced ring wear with pearlitic nodular-cast-iron rings.

He was pleased to hear from Dr. Willis of the success of nodular-cast-iron ploughshares in Australia. The ploughshare was evidently an application in which the use of nodular cast iron was economic even at present manufacturing costs. If the smaller number of shares which it would be necessary to keep in stock and the reduced man/hours spent in changing damaged shares were taken into account, the economic advantage of the nodular-cast-iron ploughshare over the fabricated-sheet-steel ploughshare might be considerably greater than a ratio of two to one.

APPENDIX TO AUTHOR'S REPLY

Particulars relating to Curves in Fig. G (Variation of Impact Resistance with Temperature)

Ferritic Nodular Cast Irons.

	Nickel, per cent.	Silicon, per cent.	Manganese, per cent.	Phosphorus, per cent.
A	1	1.4	0.14	0.026
B	1	2.5	0.15	0.020
C	1	2.5	0.51	0.019
F	1	2.5	0.88	0.022
J	1	2.1	0.14	0.078
E	1	2.2	0.14	0.16

Heat-treatment: annealed for 2 hours at 900 deg. C., furnace-cooled to 700 deg. C., held at 700 deg. C. for 24 hours, furnace cooled to 400 deg. C., then air cooled.
Striking energy in Charpy test, 30.6 kg. m.
Striking velocity in Charpy test, 5.4 m. per sec.
Source of data: Carr and Steven (1953).

Wrought Steels

(1) An ordinary mild-steel plate in the as-rolled condition, containing 0.17 per cent. carbon, 0.04 per cent. silicon, 0.04 per cent. sulphur, 0.04 per cent. phosphorus, and 0.60 per cent. manganese.
Striking energy in Charpy test, 23.3 kg. m.
Striking velocity in Charpy test, 4.9 m. per sec.
Source of data: Private communication from Colvilles, Limited.

(2) A 1½-in. dia. rolled-steel bar, normalized from 850 deg. C. Produced from an acid open-hearth steel which had been deoxidized with 12 oz. of aluminium per ton, and contained 0.35 per cent. carbon, 1.04 per cent. manganese, 0.20 per cent. silicon, 0.16 per cent. nickel, 0.05 per cent. chromium, 0.04 per cent. sulphur, and 0.033 per cent. phosphorus.
Striking energy in Charpy test, 30 kg. m.
Striking velocity in Charpy test, 5.125 m. per sec.
Source of data: Private communication from English Steel Corporation Limited.

(3) A low-alloy steel drawn tube, normalized from 900 deg. C. Produced from a steel made in a basic induction furnace, deoxidized with aluminium, and containing 0.15 per cent. carbon, 0.75 per cent. manganese, 0.12 per cent. silicon, 1.03 per cent nickel, and 0.033 per cent. aluminium.
Striking energy and velocity in Charpy test not known.
Source of data: Gillett (1941)†, Lab. 37 Steel 41.

Cast Steels

(4) A medium-carbon steel normalized from 890 deg. C. tempered for 2 hours at 650 deg. C., then air cooled.
Composition: Carbon 0.27, manganese 0.62 silicon 0.33, and sulphur 0.026 per cent.
Striking energy and velocity in Charpy test not known.
Source of data: Sims and Boulger (1946)‡, Steel 1.

(5) A manganese steel, deoxidized by the addition of 1.5 lb. aluminium per ton, normalized from 860 deg. C., tempered for 2 hours at 650 deg. C., then air cooled.
Composition: Carbon 0.29 per cent., manganese 1.49 per cent., silicon 0.42 per cent., sulphur 0.037 per cent., aluminium 0.038 per cent.
Striking energy and velocity in Charpy test not known.
Source of data: Sims and Boulger (1946), Steel 5.

(6) A 1 per cent. nickel steel, deoxidized by the addition of 1.8 lb. aluminium per ton, double normalized, then tempered at 650 deg. C.
Composition: Carbon 0.12, manganese 0.65, silicon 0.35, and nickel 1.00 per cent.
Striking energy and velocity in Charpy test not known.
Source of data: Armstrong and Gagnebin (1940)¶, Steel 4.

* Sukhodol'skaya, E. A., 1953, "Materiali Porshnevich Koleta" (Materials for Piston Rings) (Mashgiz, Moscow).

† Gillett, H. W., 1941, "Impact Resistance and Tensile Properties of Metals at Sub-atmospheric Temperatures," Project No. 18 of the Joint A.S.M.E./A.S.T.M. Research Committee on the Effect of Temperature on the Properties of Metals.

‡ Sims, C. E., and Boulger, F. W., 1946, *Trans.* Am. Foundrymen's Assoc., **54**, 357, "Low Temperature Properties of Cast Steels."

¶ Armstrong, T. N., and Gagnebin, A. P., 1940, *Trans.* Am. Soc. Metals, **28**, 1, "Impact Properties of Some Low-Alloy Nickel Steels at Temperatures Down to — 200 deg. F."

Factory Equipment Exhibition

Fuel Saving Possibilities Stressed

Whereas the average American industrial worker had some 8 h.p. at his beck and call, the figure for the United Kingdom was about 4 h.p., said Sir Miles Thomas, chairman of BOAC, when officially opening the third Factory Equipment Exhibition at Earls Court, London, on March 28. Mere muscle power was impotent unless it was applied with intelligence and foresight, he said. Any device which eliminated drudgery from industrial processes must encourage the operator to show increased enthusiasm for his work and, therefore, greater efficiency. The heartening and vigorous approach made to the problem of productivity which could be seen by visitors to the exhibition was extremely encouraging.

The Factory Equipment Exhibition closed last Saturday. Three conferences were held during the course of the exhibition—on work-study, on fuel efficiency, and on management.

Efficiency Pays

Several hundred representatives of equipment manufacturers attended a conference for industrial management on March 29 organized by the National Industrial Fuel Efficiency Service and the Combustion Engineering Association. The theme of the conference was "Fuel-efficiency Pays" and some striking figures were given of actual savings made by consumers.

At the morning session, over which Mr. B. E. A. Vigers, president of CEA, presided, Mr. John Rylands, of E. Green & Son, Limited, spoke on "Reducing Steam-raising Costs" and said that there was still a great deal to be done. In the steel industry, both large and small savings could be effected, and the cost of the fuel-efficiency equipment installed recovered many times over. Mr. P. F. Morgan, of W. H. Allen, Sons & Company, Limited, spoke on the economics of power supply.

Sir Leslie Hollinghurst, chairman of NIFES, presided over the afternoon session, when Sir Oliver Lyle gave an address entitled "Steam Saving Pays" and Mr. L. W. Jenkins discussed NIFES' contribution to fuel efficiency.

On March 28 and 30, the British Productivity Council held a conference on work-study, and from March 31 to April 2, the Institution of Works Managers held its national conference on the theme, "Maintaining Prosperity by Efficient Management."

A centre piece of the exhibition was a miniature works sports-ground. It was designed with the co-operation of the National Playing Fields Association, and presented by Tubewrights, Limited.

To show the most modern types of protective and safety clothing on professional models a specially designed and built theatre was erected. Parades took place three times daily, the equipment shown including overalls in nylon and other materials, uniforms, protective caps, hats and helmets, safety footwear, rubber boots, gloves, face shields and dust masks, breathing apparatus, and fire- and heat-resisting clothing.

PETROCHEMICALS, LIMITED—Following the acquisition of Petrochemicals by Shell Chemicals, Limited, the directors appointed by the Finance Corporation for Industry, Mr. Godfrey H. Owtram, Mr. E. J. Barnsley, Air Marshal Sir John Bradley, and Sir Robert Robinson, have resigned from the board. Mr. P. C. Chaumeton has also resigned. Shell Chemicals has appointed its own board of directors from within the Shell organization.

Schoolboys' Preview of an Industry

The post-war expansion of industry has resulted in an unprecedented demand for well-trained staff, and manufacturers are looking with increased interest to the public and grammar schools for recruits. Hitherto it has been apparent that the opportunities available in the engineering industry for training towards a professional career have not attracted a sufficient proportion of the most able boys available in these schools. Much is being done, however, by the professional institutions and by industry itself to ensure that these opportunities are properly presented to prospective candidates.

Last year a conference of headmasters and senior science masters was held at the Trafford Park works of the Metropolitan-Vickers Electrical Company, Limited, and on the basis of suggestions made then a group of 25 schoolboys will gain first-hand experience of the mechanical and electrical manufacturing industry when they attend a course at the works during the Easter holidays. The emphasis will be on boys from upper-fifth and lower-sixth forms who are still in a position to mould their later school work. Entry has not been restricted to boys who have already elected to concentrate on science, but has been extended to include a number who have so far shown an inclination towards the classical or modern sides.

The courses at Trafford Park will provide basic instruction in the use of hand and machine tools and other fundamental engineering practices and are designed to give a comprehensive picture of the company's organization. Finally, the boys will spend a full working day in a selected manufacturing department under normal working conditions.

There is a need, too, for graduates in industry. To encourage those in physics and mathematics to undertake post-graduate study or research in engineering in preparation for entry into the electrical industry, Metrovick has endowed four post-graduate bursaries in electrical and mechanical engineering.

Machine-tool Industry's Future

Speaking at the annual dinner of the Machine Tool Trades Association in London recently, Lord Chandos, chairman of Associated Electrical Industries, Limited, referred to the "truly startling" progress of the machine-tool industry in past years. Looking to the future, he said that everyone knew that industry was about to enter an even more startling phase; the increasing use of the electronic control of machine tools was ushering in a new era. He would not commit himself by saying that the automatic factory was round the corner, but it was obvious that electronic engineering was on the way to making the automatic factory.

Lord Chandos said that the machine-tool industry should be careful not to be caught in an unfortunate position. They would have solved the production problem without having considered what to do with idle hands. They must consider the position that would be created by the electronic control of machine tools and the ever-increasing use of machines for the replacement of human hands.

Tribute to the work of the association's committee, which was actively engaged in preparing for the International Machine Tool Exhibition in 1956, was paid by Mr. J. B. S. Gabriel, a past-president of the association.

A Morning in a Die-casting Shop

By V. C. Faulkner

Suratel Products, Limited, of 800/1, Oxford Avenue, Slough, Bucks, has only been established about 18 months, but during that time it has made commendable progress. The general appearance of this primarily die-castings concern is shown in Fig. 1. The building had previously been used as a steel foundry. The battery of holding furnaces was originally against the wall and this made working conditions a little hotter, due to radiation from the wall and limited the use of each furnace to one operator. With the present lay-out, each holding furnace is shared by two die-casters, thus halving the number of sources of heat production. Metal is melted in a Lees, Hall semi-rotary oil-fired furnace (Fig. 2). Various alloys are in production—including LM 6 and LM 4.

Ingots, purchased to specification, are used as raw material. They are withdrawn from the bonded stores, as the firm is A.I.D. approved. At the moment, the liquid metal is hand-shanked from the melting furnace to the holding pots, but it would be an easy matter to install a monorail to serve this purpose.

The operators are served by a battery of Morgan (and one Lees, Hall) oil-fired, holding furnaces. This shop is mainly engaged on the production of castings for light, electrical-engineering components, especially as the firm is the main supplier for Wolf Electric Tools, Limited. The average daily output varies, according to size from 100 to 200 castings per man. Though stillages are extensively used for transport, these newly made castings are stacked on the floor in batches of five or ten, which facilitates the computation of production from each die.

Much thought goes into the design of the dies and a well-equipped toolroom ensures proper die maintenance. Where possible, two runner gates are incorporated in a die set-up so that the overheating of one portion is avoided by their alternate use. Quite often, high-duty cast iron from a near-by foundry is used for the dies, which are giving a satisfactory life. Any sand cores which are to be incorporated are made from naturally-bonded Mansfield sand.

Runners and risers are removed from the castings by a pair of bandsaws. For the fettling of the castings there are three double-ended grinders and a polishing spindle for removing filing marks. After inspection, the castings are loaded into stillages and for despatch on to lorries by means of a stacking truck. The whole of the production is fettled by six men and inspected by two, whilst a furnaceman and two labourers complete the working staff.

(*Continued on page* 386 *at the foot of col.* 1)

FIG. 2.—*Collecting metal at the Lees, Hall semi-rotary oil-fired melting furnace.*

FIG. 1.—*General view of the die-casting shop at Suratel Products, Limited.*

Heavy-water Plant in New Zealand

A subsidiary of Head, Wrightson & Company, Limited, Thornaby-on-Tees, Head Wrightson Processes, Limited, announces that it has received the order from Geothermal Development, Limited, for a heavy-water plant to be erected in the Wairakei district of North Island, New Zealand.

Members of the company's technical staff have visited New Zealand on various occasions to take part in discussions concerning the project with officials of the Government, and Head Wrightson Processes, Limited, has been working with the Atomic Energy Research Establishment, Harwell, on the development of the scheme for the past few years.

In addition to the heavy-water plant, the Wairakei plant includes a power station, a compound unit, and a water pumping station. Energy supply for the operation of the plant is by means of steam which is taken from hot springs at Wairakei, and separation of the heavy water is achieved essentially by distillation. The steam is also used in turbo-alternators to generate electric power. The heavy-water plant has been designed so that each stage of distillation is performed in sets of fractionating columns operating in series.

Cooling water for the turbines is to be taken by pipes from the Waikato river and passed through sluice gates and screens before entering the pumps.

The new enterprise will fulfil this country's need of heavy water as a moderator in atomic piles connected with power generation and also New Zealand's need for additional power.

Training at Metropolitan-Vickers

In the training of apprentices at its Trafford Park, Manchester, works the Metropolitan-Vickers Electrical Company, Limited, sets a high standard. The number of trainees over the past 50 years exceeds 10,000. Recently the company has produced a booklet, "From School to Professional Engineering," aimed to inform public, secondary grammar, and secondary technical schools of the opportunities provided for training step by step with facilities for study in electrical and mechanical engineering, physics, chemistry, and metallurgy. It follows a previous publication, "The Training of the Professional Engineer" intended for those with a university education.

A Morning in a Die-casting Shop

(*Continued from page* 385)

There is a partitioned-off area for the making of sand castings. This is staffed by a couple of moulders, who also prepare the cores, which are dried in a conveniently placed home-made gas-fired oven. The sand is reconditioned by a Pneulec Royer machine.

For firms, such as Suratel, situated on the Slough Trading Estate, there are many amenities available for workpeople, but in addition Suratel have provided a rest room and showers for their own staff. The whole plant is simple, neat and eminently practical. The manager of the foundry is Mr. V. G. Brant to whom the writer expresses his thanks for the courteous reception accorded to him and for the help given in preparing this article.

Publications Received

Control of Emissions from Metal Melting Operations, published as a Committee Report by the American Foundrymen's Society, Golf and Wolf Roads, Des Plaines, Ill., U.S.A.

The work of the committee sponsoring this Report became a matter of some urgency due to adoption of smoke and air pollution ordinances in many communities. After stating the complications of problems associated with melting plant, a definition is given of air pollution. It reads "Atmospheric pollution may be defined as the presence of man-made substances in concentrations sufficient to interfere with the comfort, safety or health of man or with full use and enjoyment of his property."

It adds that "Since no measurable injury to human health has been directly traced to neighbourhood air pollution by a foundry, the industry's air pollution problem is mainly related to a public nuisance." In this case it is germane to record that most foundries can comply with the Ringelmann Scale. It is interesting to note that it is stated that "Any legislative code to be fair and equitable, must take cognizance of the fact that control requirements will vary from one area to another." Moreover good reasons are given for this statement. When dealing with the cupola two types of wet-dust collectors are illustrated and described, one a quite simple spray washer and the second a multi-stage cyclone.

A third, applicable to various types of furnaces, including the cupola, is a complicated piece of apparatus, which includes a sludge-removal system, but the first two mentioned should also have such an attachment. Then many types of plant are covered, including the hot-blast cupola and finishing with electrostatic precipitation. Attention is also given to evacuating the dust from the electric furnace. It is a very good, readable and instructive Report and one which has considerable significance to foundry concerns in this country, though obviously American practice is largely drawn upon.

Casting and Costing. A Review of Productivity in the Bronze and Brass Casting Industry; published by the British Productivity Council, 21, Tothill Street, London, S.W.1. Price 2s. 3d.

The body of this book is a review of the non-ferrous foundry industry and the productivity part is contained in the appendix, but it is no worse for that. It is just as well to have a general picture of the industry before detailing its recent improvements and the advocacy of further developments. We have one quarrel with the author of this booklet, which runs to 40 pages, and that is, the title suggests a source of information as to costing, but it really has precious little to say on the subject. The review is right up-to-date and covers not only the features brought out by the Productivity Team, but also such matters as shell moulding and the CO_2 process. The most important part of the review is the appendix, for here everybody can read what a number of firms have recently accomplished, and what equally advantageously can be done by others. Excellent propaganda is made for the trade associations and research organizations and a plea is made for better support. This is an action which the reviewer can unreservedly recommend, as at the moment far too few people are working and working hard for the benefit of the majority. The pamphlet should certainly be bought by every non-ferrous founder.

News in Brief

A TANK of 250,000-gall. capacity for storing water at Bagdad, the capital of Iraq, has been built by the Redheugh Iron & Steel Company, Limited.

BRITISH FIRMS received orders for oil equipment and materials valued at £80,392,200 in 1954, compared with the previous year's figure of £67,124,000, according to statistics issued by the council of British Manufacturers of Petroleum Equipment.

THE GENERAL ELECTRIC COMPANY, LIMITED, is to build a large works in Canada, according to an announcement in Montreal by Mr. Leslie Gamage, vice-chairman and joint managing director of the company, who is nearing the end of a two-month world tour.

STATISTICS compiled last October by the Ministry of Labour covering 7,000,000 manual workers show that in the last pay week in October, 1954, the highest paid was the metal manufacturing group. Average weekly earnings for all workers was £10 13s. 5d.

A NEW HYDRAULICS LABORATORY for the training of graduates in the field of aeronautical and hydraulic engineering, at the engineering department of Nottingham University, was officially opened by Mr. C. V. Armitage, director of Gwynnes Pumps, Limited, on March 22.

SUGGESTIONS for improving Press relations have been sent in a circular from the Scottish Council of the Federation of British Industries to 1,100 firms. The council thinks that in every firm one senior official should have the responsibility of providing information and guidance to newspaper men.

SHAW PROCESSES, LIMITED, have made arrangements in conjunction with Mr. Nicholas Herzmark, 21, Avenue de Lamballe, Paris—European concessionaire of the Shaw process—for a licence to be issued to and a demonstration foundry established at Otto Junker GmbH, of Lammersdorf, Germany.

THE FEDERATION OF LIGHT METAL SMELTERS announces that, following recent wage awards, its members have found it necessary to increase the maximum selling prices of the undermentioned alloys by £2 per ton. From April 1 until further notice prices are as follow:—L M 1, £183 per ton; L M 2, £185; L M 4, £187; L M 6, £190.

THE WORKS COUNCIL of Samuel Fox & Company, Limited, steelworks, Stocksbridge, near Sheffield, were addressed at a dinner on March 26, by Mr. S. R. Howes, general manager. He said that since the war almost £10,000,000 had been or was being spent in development, and further schemes involving very large capital expenditure were under consideration for the future.

SIXTEEN MEMBERS of an official British trade mission to China led by Mr. Sydney Lane, of the Brush Group, Limited, left for Canton on March 27 for business discussions at the invitation of the China National Export and Import Corporation. Mr. Lane said that the negotiations would cover both barter and cash payments, and added that all transactions would be in sterling.

AN ORDER has been received by the General Electric Company, Limited, through its Australian subsidiary, the British General Electric Company Pty., Limited, for electric winding equipment for Cessnock Collieries, Limited, Australia. The equipment to be supplied includes a single drum winder 14 ft. in diameter, designed for an output of 248 tons per hour, winding from a depth of 1,227 ft.

MR. ISAAC BLEWITT who has worked for 61 years at Joseph Sankey and Sons, Limited, Bilston, has been awarded a gold watch to mark his long service. Though 74 years of age he still works in the Bankfields section where he started in 1893 before Joseph Sankey took over. Mr. Blewitt was among seven employees who received watches for more than 50-years' service with Sankeys.

Mr. COLIN GRESTY, director and foundry manager of the North Eastern Marine Engineering Company, Limited, Wallsend-on-Tyne, will be one of the principal speakers at the national industrial safety conference which the Royal Society for the Prevention of Accidents is organizing at Scarborough from May 20 to 22. Mr. Gresty has chosen "Safety in the Iron Foundry" as the subject of his address.

BELLS for the Westminster-chimes clock made by John Smith & Sons, of Derby, for Queen Salote of Tonga, have been cast in the foundry of John Taylor & Company, of Loughborough. Weighing a total of half-a-ton, they are of varying sizes, constructed of tin and copper alloy with strikers of cast iron. The clock is to be installed in the Royal Chapel adjoining the palace at Nukualofa, Tonga.

AN ORDER for four cargo motorships worth more than £2,000,000 has been placed at Sunderland by the Silver Line, of London. Two ships of 11,700 tons each will be built by Sir James Laing & Sons, Limited, a third of 11,950 tons by Bartram & Sons, Limited, and the fourth of 10,000 tons by John Brown & Sons, Limited. The machinery will also be built at Sunderland by William Doxford & Sons, Limited. The ships are due for delivery in 1957.

BIRMINGHAM PRODUCTIVITY ASSOCIATION, in conjunction with the Institution of Works Managers organized at the College of Technology, Birmingham, on April 5 a Forum entitled "Increased productivity—to what purpose?" Mr. A. B. Waring, chairman of the BPA, presided. The forum considered not only how greater productivity can be achieved but also the broader social and economic considerations that lie behind the drive.

IN CONNECTION with the Institute of Metals 1954 Students' Essay Competition, the first prize of 25 guineas has been awarded to Dr. A. P. Miodownik, B.SC., L.I.M., a research investigator at the Battersea College of Technology, for an essay on the "Significance of Microhardness Testing." Mr. Surindar Singh, a student at the County Technical College, Wednesbury, won the second prize of 15 guineas for an essay on the "Kirkendall Effect."

THE COMPANY was considering spending £2,000,000 on further development at the Heaton south works, Newcastle-upon-Tyne, according to Sir Claude Gibb, chairman and managing director of C. A. Parsons & Company, Limited, turbine manufacturers. Sir Claude will become chairman and Mr. G. M. Sisson, general manager, will become managing director of the subsidiary, Sir Howard Grubb Parsons & Company, which is to be formed into a limited company.

THE ADMINISTRATORS of the Sir George Beilby Memorial Fund have made awards of one hundred and fifty guineas each to Dr. H. K. Haray, M.SC., PH.D., A.R.S.M., and Dr. J. W. Menter, M.A., PH.D., A.INST.P. The former for his work on physical metallurgy, with special reference to precipitation hardening and to the thermodynamics of phase equilibria in alloy systems.

News in Brief

The latter for work on surface phenomena, particularly the application of electron optical techniques.

AFTER being on strike for a week, nearly 80 moulders employed by the Falkirk Iron Company, Limited, decided at a week-end meeting to return to work on March 28. Strike action was taken when the management employed four men as trainee moulders. An official of the company stated that the four trainees would still be employed in the foundry, but not in the moulding shop as trainees. Other work would be found for them until some agreement had been reached.

Mr. BARRY KAY, Board of Trade Regional Controller for the Midland area visited Londonderry on March 23 and inspected a number of potential factory sites. Mr. Kay also visited a number of factories as part of an extensive survey of sites and facilities in Northern Ireland. On his return he reported that he had been greatly impressed with the standard of labour available. He also said that there is an increasing interest being shown by Midland industrialists in Ulster generally.

IN A Covmac horizontal forging and upsetting machine used for making forgings for the motor, agricultural, textile and engineering trades, the body is an Edgar Allen steel casting of 255 cwt., finished weight, requiring 17 tons of metal to cast. Eighty-three cores were used in the making of the casting, as compared with the normal 25-30 for a casting of this weight, as the pattern consisted of one solid block of wood, the shape being achieved solely by the use of cores. The machine is manufactured by John Stirk & Sons, Limited, Halifax.

FROM APRIL 1 higher renewal fees will be charged for Trade Marks registrations due to expire after June 30, 1955; and after the latter date there will be a general increase in the fees payable in respect of a number of trade marks matters. The fees have remained substantially unchanged for many years despite considerable increases in administrative costs. This change is announced by the Board of Trade who have laid before Parliament revised rules which amend those made under the Trade Marks Act, 1938.

THE POINT that flag discrimination has the effect of increasing freight costs and is therefore the "self-convicted enemy" of users of sea transport was made in a speech by Mr. A. I. Anderson, president of the Chamber of Shipping, at the annual dinner of the London and District Association of the Institute of Chartered Shipbrokers. Already, he said, the freight rates on that part of our recent purchase of coal from America, which was being carried in American ships under the 50 per cent. rule, were 20 per cent. higher than those on that carried in ships fixed on the free market.

IN the four weeks ended March 19, 30,600 tons of iron were turned out by the most recently commissioned blast furnace at the Appleby-Frodingham steelworks, Scunthorpe. It is said to be the first time in the history of the industry in this country that a furnace has produced over 30,000 tons of iron in four weeks. The four furnaces at Appleby-Frodingham reached the record figure during those four weeks of 95,430 tons, an increase of 3,750 tons above the previous record made last December. 88,629 tons of ingots were made in the combined melting shops at the plant in the same four weeks, compared with the previous highest of 87,398 tons in January.

MR. JOHN NORTON, chairman of Norton Industries, Limited, told shareholders at Wolverhampton on March 30, that although the past year had been one of difficult trading in the foundry business there has, over the last few months, been some measure of improvement in trade. The scrap metal section of the firm is showing very pleasing results, he said. It is anticipated that the recent acquisition by the company of the old-established business of Aymer Barrow, Limited, Wolverhampton, iron and steel merchants and dealers, in ferrous and non-ferrous scrap, will greatly expand the group's activities in the raw material market.

AT HALESOWEN on March 25 the Worcester County and City Joint Valuation Panel decided that the British Cast Iron Research Association must pay rates on its premises at Bordesley Hall, Alvechurch. The Court allowed an appeal by the valuation officer (Mr. G. E. Linley) who claimed that an office, workshop and two cottages were no longer entitled to exemption from rating under the Scientific Societies Act, 1843. Mr. T. D. Hall, Treasury solicitor, said there was no dispute about the valuation figures, the sole issue was whether the Association was scientific within meaning of the Act. To satisfy the Act, societies had to comply with five conditions. Claiming that the Association failed on two conditions, Mr. Hall said that it was not instituted exclusively for science and it was not supported wholly or in part by voluntary contributions. The Association had taken out patents which made it a trade organization. Dr. J. G. Pearce, director of the Association, said that funds for running it came from the Joint Iron Council and not from members; it could not distribute any profits among members and its work was experimental, with the service to members incidental. For the owners, Mr. G. Grove said that basically the Association existed for the purposes of science. Activities at Bordesley Hall were scientific in the highest degree. Announcing the Court's findings, the chairman, Councillor W. Parkes who described the case as important to the Midlands, said: "The Court of Appeal has instructed us that the best method of dealing with these cases is to examine the memorandum of the society concerned. We have come to the conclusion that the Association is not instituted for science exclusively."

Falling Castings Blamed

An action for damages against Stanton Ironworks Company, Limited, failed in an adjourned judgment at Derby County Court by Judge Sir Henry Braund on April 1. George Wooley (48), a labourer, claimed £200 damages alleging negligence and breach of statutory duty by the firm which caused an injury to his leg at work on June 30, 1953, when he was employed as a sweeper and general labourer. The judge stated that the accident occurred when Wooley stepped over three raised rails on which segments, 20-in. high and weighing 2¼ cwt., were resting at intervals of 2 ft. A segment fell and trapped his leg. The surface of the segments was uneven and they were resting on the rails to be fettled. He said, "The segments could easily be pushed or knocked by fettlers using hammers and chisels. This is what sometimes happens. The one segment hit another and a cascade —like a pack of cards falling—was started." He added that it was not certain how the accident happened, it might have been Wooley or one of the fettlers that started the cascade of segments. Wooley had been told that he was not to go over the rails and it was not necessary to climb over them to clean underneath, and he knew it was extremely dangerous to climb over the rails. The claim was dismissed with costs against Wooley.

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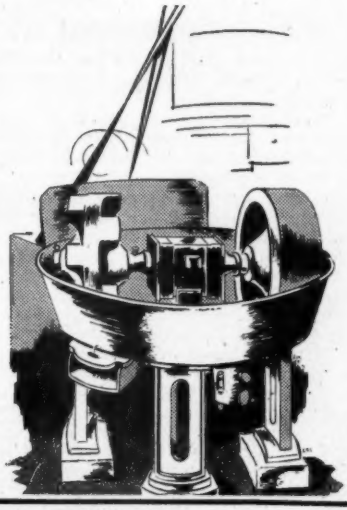

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IMPORTANT NOTICE!

On the occasion of the forthcoming International Foundry Congress to be held in London from June 19 to 26, 1955, the FOUNDRY TRADE JOURNAL will publish a special

INTERNATIONAL CONGRESS NUMBER

It will be separate and apart from normal weekly issues, and will appear on **June 11, 1955.** It will comprise a complete guide to the Congress and will clearly be in constant use throughout the meeting and be retained as a record and a souvenir of the occasion for many years to come.

Advertising space is available for those firms—and they will be many—who wish to take advantage of this unique opportunity. Copy and blocks must be in our hands by **May 9** at the very latest; full details regarding rates, etc. are available now from:

THE ADVERTISEMENT MANAGER
FOUNDRY TRADE JOURNAL
17/19 JOHN ADAM STREET, LONDON W.C.2
phone: TRAfalgar 6171 *grams:* Zacatecas, Rand

Personal

Mr. D. J. AULD, chief metallurgist, Glanmor Foundry Company, Limited, Llanelly, has been appointed a director.

Mr. M. C. IRWIN has been elected president and Mr. B. M. HAYES vice-president of the South Wales and Monmouthshire Association of Iron, Steel, Tinplate, Metal Scrap Merchants.

Dr. T. B. CROW, until recently metallurgical consultant to John Williams & Sons (Cardiff), Limited, and technical director of Emery Brothers, Limited, has now joined the research and development staff of Foundry Services, Limited, Birmingham, 7.

QUEEN'S UNIVERSITY, Belfast, has appointed Prof. P. L. BURNS to the Chair of Electrical Engineering. Mr. T. P. ALLEN has been appointed to the Chair of Light Electrical Engineering, and Prof. F. V. WARNOCK to the Chair of Mechanical Engineering.

Mr. J. P. CLIFTON has been appointed manager of the contract department at the Witton Works of the General Electric Company, Limited, in succession to the late Mr. W. E. Evans. Mr. Clifton joined GEC in 1935 as deputy manager of the department.

Mr. BENJAMIN GARDNER has been re-elected general secretary of the Amalgamated Engineering Union, a position he has held for 12 years. In a ballot he obtained 45,891 votes, which gave him a majority of 28,386 over the other four candidates combined.

Mr. W. B. G. COLLIS has been appointed manager of the traction department of the British Thomson-Houston Company, Limited, in succession to the late Mr. E. T. Hippisley. In 1953, Mr. Collis was appointed assistant sales manager in charge of the Metropolitan-Vickers traction staff in London.

Mr. WILLIAM SCOTT, O.B.E., J.P., has sailed for New York. He is managing director of Armstrong Whitworth (Metal Industries), of Close Works, Gateshead, and Jarrow Metal Industries, Limited, and a past-president of the Newcastle branch of the Institute of British Foundrymen. In America he is to discuss rolls and oil-fired equipment.

Mr. E. AUSTYN REYNOLDS, well known in the aluminium industry for the past 20 years, has resigned his position as director of development with T. I. Aluminium, Limited, for personal reasons. He joined the parent board of Tube Investments, Limited, at the age of 35 and served on it for 17 years. He is a former president of the Aluminium Development Association.

Mr. D. M. GILL has been appointed a technical representative in the north-west England area of the process control division of Sunvic Controls, Limited, and Mr. F. N. YATES will be the technical representative in the area for the scientific and industrial divisions. These divisions' technical representative in the London and Home Counties area is now Mr. W. F. DORMAN, while Mr. F. C. CHAVENTRE will in future be the technical representative in the same area for the process control division.

Company News

P. & W. MACLELLAN, LIMITED—A dividend of 10 per cent. is announced, against 8 per cent. previously.

PRESSED STEEL COMPANY, LIMITED—A final dividend of 15 per cent. is announced, making 22½ per cent., compared with 17½ per cent. in the previous year.

MODERN MACHINE TOOLS, LIMITED—Stockholders are to be kept closely informed of all developments following a tentative bid for the company's stock of 14s. a unit.

DERBYSHIRE STONE, LIMITED—On capital increased by a 33⅓ scrip issue a dividend of 16 per cent. is being paid, compared with the 17½ per cent. paid on smaller capital.

CROFTS ENGINEERS (HOLDINGS), LIMITED—The final dividend of 15 per cent. makes a total of 22½ per cent. on capital increased by a 100 per cent. scrip issue. In the previous year an equivalent of 20 per cent. was paid.

RANSOMES & RAPIER, LIMITED—The company is making a rights issue of 136,000 ordinary 10s. shares on a one-for-eight basis at 17s. 6d. a share. In addition, £150,000 4½ per cent. second mortgage debenture stock is to be placed at or about par.

CROSSLEY BROS., LIMITED, makers of Diesel and gas-engine and gas-producer plant, of Manchester—An interim dividend of 3 per cent. is to be paid on the deferred capital increased by a 66⅔ per cent. scrip issue, against 5 per cent. on the old capital.

ALLEN WEST & COMPANY, LIMITED, electric control and switchgear manufacturers, of Brighton—The company will pay a dividend of 15 per cent. on the capital increased by a 50 per cent. scrip issue, compared with 15 per cent. and a bonus of 2½ per cent. on the old capital.

BRITISH OXYGEN COMPANY, LIMITED—The preliminary announcement, which includes news of a further increase in group profits, states that trading activities at home and overseas continue to expand and the larger overseas companies are making an increasing contribution to profits.

EDGAR ALLEN & COMPANY, LIMITED—The chairman states that it would appear that the current year's earnings will be at least equal to those of last year, and he anticipates a dividend of 12½ per cent. on the capital as doubled by the pending scrip issue (against the equivalent of 10 per cent.).

JAMES BOOTH & COMPANY, LIMITED—Reserves totalling £750,000 are to be capitalized to make a free issue of 750,000 ordinary £1 shares to holders registered on April 11 at the rate of one for each share held. The new shares would rank *pari passu* with the existing ordinary, without the right to any dividend in respect of 1954.

PARSONS ENGINEERING COMPANY, LIMITED—The offer made by Associated British Engineering, Limited, to acquire the 1,158,000 1s. shares has been accepted by over 90 per cent. Subject to a quotation being granted for ABE ordinary stock forming the consideration for such acquisition, the provisional agreement will become unconditional.

Obituary

Mr. THOMAS FULTON, who died on March 28, was secretary of William Bain & Company, Limited, Lochrin Ironworks, Coatbridge (Lanarkshire).

Mr. THOMAS WOODHOUSE PATON, of Thos. W. Paton, engineers, machinery and scrap-metal merchants, of Wishaw (Lanarkshire), died on March 26 at the age of 82.

Col. FRANCIS EUGENE LAUGHTON, a former works manager of the North British Aluminium Company, Limited, at Lochaber (Inverness-shire), has died at the age of 68.

Mr. T. S. HALL, who has died at Greetham, near Oakham (Rutland), at the age of 87, was for many years manager of the Manchester branch of the Thorncliffe ironworks of Newton Chambers & Company, Limited.

Non-destructive Testing in Industry . . .

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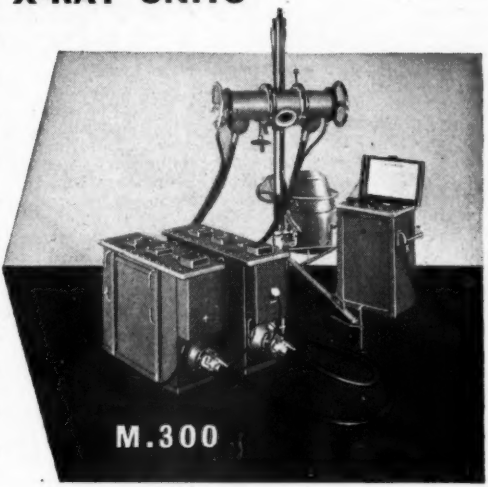

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The control table provides pre-indication of adjusted kV and for the measurement of tube current. High tension can be applied immediately—no "building up" period is required.
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Raw Material Markets

Iron and Steel

The shortage of pig-iron is becoming a somewhat serious bottleneck. Later in the year more blast-furnace capacity will be available, but current production is definitely short of requirements. It is only a temporary gap, and so far as steelmakers' needs are concerned it should shortly be bridged by the arrival of consignments of Russian pig-iron purchased towards the end of last year, but foundrymen's difficulties are more intractable. They have a much increased weight of orders in hand and it would be a pity if their completion should be delayed by lack of pig-iron. Unfortunately, this is not a remote contingency, as only restricted deliveries of the better grades of pig-iron are coming to hand and even supplies of high-phosphorus iron are barely adequate.

The chief problem of the steel industry is the provision of ample tonnages of crude and semi-finished steel. There is no serious shortage of finishing capacity, but re-rollers are still anxiously seeking prime or defective billets, crops, and even scrap to keep their mills in full operation. A slightly easier tendency in the European steel markets encourages the hope that supplies may become more freely obtainable from that source, but some buyers have gone as far afield as the United States for marginal tonnages.

The beginning of the second period discovers the steelmakers with an unprecedented weight of orders on their books. At the end of March, deliveries were heavily in arrears and commitments for the second quarter are so formidable that there is not much scope for further acceptances. Demands are on familiar lines. The motor industry is relying on the regular shipment of sheet steel from America. On the other hand, there is a large overseas demand for black and galvanized sheets of British manufacture which can only be partially satisfied. Expansion of plate production has enabled the mills to overtake home requirements and to accept more export business, and there has been a big jump in the exports of bars, sections, and tubes. The flood tide of specifications for all types of structural steel continues and there is a swelling demand for railway and colliery equipment.

Non-ferrous Metals

With the approach of the Easter holidays there has been a tendency for business with consumers to ease and next week, when many Midland firms will not reopen until Wednesday, is also likely to prove a slack period.

Trading last week was on the quiet side, but, on the whole, prices were very steady, with a tendency to ease slightly. To other uncertainties must now be added the prospect of a general election within the next few weeks. Trade in the country continues to be active and consumption of metals is on a good scale. There are, however, aspects of the economic situation which give food for serious thought, chief of these perhaps being the decline in our participation in some of the export markets.

Last week saw a rise in the US copper price of 3 cents to 36 cents, delivered Valley, this revised level being equal to about £288 per ton, which is a long way below the current London quotation. In the copper ring last week trading was rather quieter than of late, but the tone was very steady and there is no prospect of much setback at the present time. Actual changes were a drop of £3 10s. in cash and of £4 in three months, the backwardation being £10 10s. at the close of business last Friday afternoon. There was little change in zinc, but the tone was also steady, prompt being 5s. up and forward 10s. better. In lead the improvement amounted to gains of 5s. and 7s. 6d. for the respective positions. Tin remains in a state of suspense pending some clarification of the American scene, where the future of the Texas smelter is still undecided. Ratification of the international agreement has yet to be completed, but it can hardly be doubted that this will accrue in due course.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* March 31, £363 10s. to £364; April 1, £360 to £361; April 4, £352 to £352 10s.; April 5, £351 10s. to £352.

Three Months: March 31, £354 10s. to £355; April 1, £352 10s. to £353; April 4, £345 10s. to £346; April 5, £344 to £345.

TIN, Standard—*Cash:* March 31, £716 to £717; April 1, £714 10s. to £715; April 4, £711 to £712; April 5, £712 to £713.

Three Months: March 31, £717 to £718; April 1, £715 to £715 10s.; April 4, £713 to £714; April 5, £714 to £715.

LEAD—*Second half March:* March 31, £103 10s. to £104. *First half April:* April 1, £104 5s. to £104 10s.; April 4, £104 to £104 5s.; April 5, £104 5s. to £104 10s.

Second half June: March 31, £103 10s. to £103 15s. *First half July:* April 1, £103 10s. to £103 15s.; April 4, £103 5s. to £103 10s.; April 5, £103 10s. to £103 15s.

ZINC—*Second half March:* March 31, £88 to £88 5s. *First half April:* April 1, £88 10s. to £88 15s.; April 4, £88 to £88 5s.; April 5, £89 5s. to £89 10s.

Second half June: March 31, £87 5s. to £87 10s. *First half July:* April 1, £87 5s. to £87 15s.; April 4, £87 to £87 5s.; April 5, £88 5s. to £88 10s.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade, Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone CHAncery 4411, ext. 738 or 771), unless otherwise stated.

KUWAIT, May 24—Gate valves, for the Department of Electricity, Government of Kuwait. (ESB/6058/55.)

KUWAIT, June 21—Steel pipe fittings with couplings, nuts for ammonia plants, steel valves and strainers, for the Department of Electricity, Government of Kuwait. (ESB/6062/55.)

SOUTH AFRICA, April 20—Heat-treatment furnace, for the Stores Department of the South African Railways. (ESB/6380/55.)

URUGUAY, April 21—Copper-beryllium alloy safety tools, for the Administracion Nacional de Combustibles Alcohol y Portland. (ESB/6312/55.)

THE MANAGEMENT AND STAFF OF TYSELEY METAL WORKS, LIMITED, wish to record their thanks to their many friends for their expressions of sympathy in the passing of the managing director, Mr. W. G. Booth. Provision has been made for carrying on the business with the full staff and, in tribute to Mr. Booth's memory, with renewed vigour.

THE EXPORT CREDITS GUARANTEE DEPARTMENT announces that its Sheffield office took over new premises at Orchard Chambers, 27A Church Street, Sheffield 1 (telephone: Sheffield 29151) on April 5. Mr. T. H. Collinson, the local ECGD manager, states that his office is at present handling short-term policies with a face value of some £15,750,000 annually: this represents an increase of some £1,000,000 over the last six months. In addition, ECGD has some £8,000,000 of medium-term business in the area.

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Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

April 5, 1955

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £15 12s. 0d.; Birmingham, £15 5s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £17 13s. 9d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £18 9s. 3d.

Scotch Iron.—No. 3 foundry, £18 2s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £20 4s. 0d.; South Zone, £20 6s. 6d.

Refined Malleable.—P, 0.10 per cent. MAX.—North Zone, £21 1s. 6d.; South Zone, £21 4s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £18 2s. 6d.; Scotland (Scotch iron), £18 9s. 0d.; Sheffield, £19 7s. 6d.; Birmingham, £19 14s. 6d.; Wales (Welsh iron), £18 9s. 0d.

Basic Pig-iron.—£15 15s. 6d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots).—40/55 per cent., £40 15s. 0d., basis 45 per cent. Si, scale 15s. per unit; 70/84 per cent., £63 0s. 0d., basis 75 per cent. Si, scale 16s. per unit.

Ferro-vanadium.—50/60 per cent., 23s. 8d. to 25s. 0d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 11s. 0d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £161 0s. 0d. to £165 0s. 0d. per ton; 38/40 per cent., £258 0s. 0d. to £262 0s. 0d. per ton.

Ferro-tungsten.—80/85 per cent., 15s. 2d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 18s. 2d. per lb. of W.

Ferro-chrome (6-10 ton lots).—4/6 per cent. C, £80 0s. 0d. to £82 0s. 0d., basis 60 per cent. Cr, scale 25s. 0d. per unit; over 6 per cent. C, £78 0s. 0d. to £80 0s. 0d., basis 60 per cent. Cr, scale 24s. 0d. per unit; 2 per cent. C,* 1s. 10d. per lb. Cr; 1 per cent. C,* 1s. 11d. per lb. Cr; 0.15 per cent. C,* 1s. 11d. to 2s. 1d. per lb. Cr; 0.10 per cent. C,* 1s. 11d. to 2s. 2d. per lb. Cr; 0.06 per cent. C,* 2s. 3d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 7½d. to 7s. 1d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £225 0s. 0d. to £232 0s. 0d. per ton; 96/98 per cent., £259 0s. 0d. to £265 0s. 0d. per ton.

Ferro-columbium.—60/75 per cent., Nb + Ta, 52s. 6d. to 70s. 0d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £53 17s. 6d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £25 5s. 0d.; tested, 0.08 to 0.25 per cent. C, £26 5s. 0d.; hard (0.41 to 0.60 per cent. C), £27 10s. 0d.; silico-manganese, £34 10s. 0d.; free-cutting, £29 6s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £32 17s. 0d.; silico-manganese, £34 10s. 0d.

* Average 68-70 per cent.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £29 13s. 6d.; basic, hard, over 0.41 up to 0.60 per cent., C, £30 16s. 0d.; acid, up to 0.25 per cent. C, £33 15s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £31 1s. 6d.; boiler plates (N.-E. Coast), £33 11s. 6d.; flo plates (N.-E. Coast), £32 10s. 6d.; sectional materia N.-E. Coast, £29 4s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in untested, £31 19s. 6d.; flats, 5 in. wide and under, £31 19s. 6d hoop and strip, £33 1s. 6d.; uncoated strip mill coils, h rolled, under 3mm. to 12g., £34 5s. 0d.; black sheets (han mill), 17/20 g., £43 13s. 6d.; galvanized corrugated sheet 24 g., £55 4s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £54 7s. 9 nickel-chrome, £76 7s. 9d.; nickel-chrome-molybdenum £86 8s. 6d.

NON-FERROUS METALS

Copper.—Cash, £351 10s. 0d. to £352 0s. 0d.; thr months, £344 0s. 0d. to £345 0s. 0d.; settlemen £352 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 3s. 5½d. per l rods, 403s. 0d. per cwt. basis; 20 s.w.g., 434s. 3d. per cw

Tin.—Cash, £712 0s. 0d. to £713 0s. 0d.; three month £714 0s. 0d. to £715 0s. 0d.; settlement, £713 0s. 0d.

Lead (Refined Pig).—First half April, £104 5s. 0d. £104 10s. 0d.; first half July, £103 10s. 0d. £103 15s. 0d.

Zinc.—First half April, £89 5s. 0d. to £89 10s. 0 first half July, £88 5s. 0d. to £88 10s. 0d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all Engli destinations, £119 10s. 0d.; rolled zinc (boiler plates), English destinations, £117 5s. 0d.; zinc oxide (Red Se d/d buyers' premises, £103 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 2s. 8¾d. per lb.; ro drawn, 3s. 6d.; sheets to 10 w.g., 350s. 0d. per cwt.; w 3s. 3¾d.; rolled metal, 335s. 9d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £224; B6 (85/1 £308; BS249, £238.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £2 HTB2 (38 tons), £277; HTB3 (48 tons), £285.

Gunmetal.—RCH, 3/4 per cent. tin, —; BS1400, LA (85/5/5/5), £301; LG3 (86/7/5/2), £309; G1 (88/10/2/ £384; (88/10/2/1), £374.

Phosphor Bronze.—BS1400, PB1 (AID released), £2 per ton.

Phosphor Bronze Strip, etc.—Strip, 486s. 0d. per cw sheets to 10 w.g., 509s. 6d. per cwt.; wire, 4s. 11¼d. per rods, 4s. 4d.; tubes, 4s. 2¼d.; chill cast bars: solids 4s. 3 cored 4s. 4¼d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide 0.056, 4s. 1¼d. per lb.; round wire, 10g. in coils (10 cent.), 4s. 6¾d.; special quality turning rod, 10 per cw ½ in. dia., in straight lengths, 4s. 5¾d. All prices are n

Other Metals.—Magnesium, ingots, 2s. 3d. per Antimony, English, 99 per cent., £210 0s. 0d. Quicksil ex-warehouse, £108 10s. 0d. to £109 0s. 0d. Nickel, £519 0s. Aluminium, ingots, £163 0s. 0d.; aluminium bronze (BS14 AB1, £343; AB2, £353. Solder, brazing, BS1845, 2s. 9d granulated, 3s. 0d. lb.

Forthcoming Events

APRIL 12

Incorporated Plant Engineers

Manchester branch:—"Care and Maintenance of Internal-combustion and Light Diesel Engines," by F. N. Warmisham, 7.15 p.m. at the Engineers' Club, Albert Square.

Institution of Production Engineers

Birmingham graduate section:—"Efficient Production Methods Applied to Ironfounding," by G. W. Nicholls, 7 p.m., at the James Watt Memorial Institute, Great Charles Street.

APRIL 13

Institution of Chemical Engineers

North Western branch:—"Engineering in Chemical Plants," by O. W. Murray, 7 p.m., at the Grosvenor Hotel, Chester. Joint meeting with the Institute of Petroleum (Stanlow branch) and Society of Chemical Industry (Liverpool branch).

Institute of Industrial Supervisors

South-Western section:—"Make-up of a Business," by H. C. Dyer, 7.30 p.m., at Wallington Weston Limited, Frome.
Warrington section:—"Industrial Lighting," by A. Wilcock, 7.15 p.m. at the White Hart Hotel.

APRIL 14

Institute of British Foundrymen

Beds. and Herts section:—"Non-ferrous Castings," by H. Thompson, 7.30 p.m., in the Small Assembly Room, Luton Town Hall.

Engineers' Guild

Metropolitan branch:—"Interplanetary Travel," by G. S. Brosan, 6 p.m., at Caxton Hall, Caxton Street, London, S.W.1.

Institute of Industrial Supervisors

Coventry section:—Industrial Film Night—Including: "Packaged Power," and "They're Everywhere." 7.30 p.m. at Craven Arms Hotel, High Street.

Newark-on-Trent section:—"Selecting the Man for the Job," by H. H. Blockley, 7.30 p.m., at the Robin Hood Hotel.

Incorporated Plant Engineers

North-East branch:—Film "They're Everywhere," introduced by G. E. Hemming, 7 p.m., at Roadway House, Oxford Street, Newcastle-on-Tyne.

Institute of Metals

London local section:—Annual general meeting followed by discussion on "Recent Developments in Special Machining Techniques," 6 p.m. at the Institution of Mechanical Engineers, 1, Birdcage Walk, Westminster, S.W.1.

APRIL 15

Institute of Industrial Supervisors

North-Western section:—"The Foreman's Share in Management—it's Responsibilities and Rewards," by S. Waugh, 7.30 p.m., at the Engineers' Club, Albert Square, Manchester.

Institution of Mechanical Engineers

General Meeting arranged in conjunction with the Industrial Administration and Engineering Production Group. "Surface Examination by Reflection Electron Microscopy," by J. S. Halliday, Ph.D., 5.30 p.m. at 1, Birdcage Walk, Westminster, S.W.1.

Mr. R. K. JACKSON, secretary of the Burnley section of the Institute of British Foundrymen, last week flew to India on a business visit of from three to six months.

THERE WAS a record attendance to hear Mr. Talbot's Paper on the CO_2 Process read before the London branch of the Institute of British Foundrymen on March 30. Since then he has been overwhelmed with requests for visits to his firm, Western Foundries and he suggests that to avoid disruption of normal operations these visits should be restricted to organized parties on Saturday mornings.

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CLASSIFIED ADVERTISEMENTS

PREPAID RATES: Twenty words for 5s. (minimum charge) and 2d. per word thereafter. Box Number 2s. extra (including postage of replies).

Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, John Adam House, 17/19, John Adam Street, Adelphi, London, W.C.2. If received by first post Tuesday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

ADVERTISER with own patterns and having valuable old established connection supplying considerable tonnage to customers of repetition iron castings, 3 cwts.—2 tons each, which are very plain, compact and not machined, seeks post or arrangement with foundry interested in making these. Lancashire area preferred. Replies treated in strictest confidence.—Box AW175, FOUNDRY TRADE JOURNAL.

EXPERIENCED FOUNDRY MANAGER (45), Grey high duty, non ferrous, malleable (whiteheart), desires post, Midlands. Accept full control entire foundry. Estimates, quotations, sales and commercial experience if required. M.I.B.F., A.M.I.P.E.; available short notice. Box EF182, FOUNDRY TRADE JOURNAL.

FOUNDRY METALLURGIST/FOREMAN, A.M.I.B.F., age 28, requires progressive position in small West Midland Foundry. Experienced Cupolas, Sand and Metal Control, Semi and Mechanisation, shell moulding, gaseous annealing, high duty, phosphoric and malleable cast iron. Box FM200, FOUNDRY TRADE JOURNAL.

FOUNDRYMAN, experienced malleable and Grey-Iron Jobbing and Mechanisation, Cupola, Sand, Laboratory Control, commercial organisation, seeks high-level Executive position. Capable taking complete control; Midlands or South preferred. Box FE202, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive or a woman aged 18-59 inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order, 1952.

PATTERNMAKERS required, used to first-class Wood and Metal work. Excellent conditions, canteen, music while you work, etc., top wages and bonus, by the oldest (85 years) established firm, with the absolute highest reputation. Main suppliers for many years to all firms of importance in the entire country and the finest Plant and Equipment in the world.—Apply WRIGHT & PLATT, LTD., the World's Largest Engineering Patternmakers, Irving Street, Birmingham. Vacancies at Manchester branch. Apply Springfield Lane Works, Salford, 3.

FOUNDRY FOREMAN (SENIOR) required for large semi-mechanised iron foundry in the Glasgow Area. Superannuation scheme; good salary offered to successful applicant. Reply to Box FF172, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN required to run small jobbing foundry making high class engineering castings up to 1 ton. Must have full experience of intricate cored work, able to control labour and get results. Good salary and excellent prospects for suitable applicant. Box FF201, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

YOUNG man Inter. B.Sc. or Chemistry to equivalent standard who has completed military service to train as ASSISTANT METALLURGICAL CHEMIST. Unique opportunity for right man. Apply PERSONNEL MANAGER, BROOM & WADE, LTD., Hughenden Avenue, High Wycombe, Bucks.

A YOUNG MAN is required for sand control in a highly mechanised malleable foundry near Lincoln. A sound knowledge of testing and control of synthetic sands is essential and familiarity with continuous sand mill practice desirable. Write giving full details of qualifications and experience. Box AY176, FOUNDRY TRADE JOURNAL.

FOREMAN COREMAKER required for foundry producing small and medium sized intricate castings. Must be fully conversant with production of coreboxes for blowing and able to control approximately 30 coremakers. North Birmingham Area. State age, experience, and salary expected. Box FC177, FOUNDRY TRADE JOURNAL.

EXPERIENCED FOUNDRY FOREMAN required, used to Iron Castings in Loam and Sand up to 25 tons in weight, for Chemical Plant, Machine Tools and General Engineering requirements. Excellent prospects for a first class man. House available. Write, giving age and full details of experience, to DISTINGTON ENGINEERING CO., LTD., P.O. Box No. 8, Workington, Cumberland.

ENGINEERING Factory in Ipswich require a MECHANICAL DRAUGHTSMAN for General Mechanical and Foundry Plant Layout Work. Must have had full apprenticeship with Technical Education preferably with Higher National Certificate Standard. Superannuation and Free Life Assurance will apply after 12 months' employment. Applications stating age, qualifications, experience and salary required, should be addressed to Box EF183, FOUNDRY TRADE JOURNAL.

A YOUNG MAN conversant with rain-water and soil trade required for the Sales Office of modern foundry in South West London. This position has excellent prospects and there is the possibility of a house being available after a short probationary period. Applications should give details of age, experience and salary required. Box AY186, FOUNDRY TRADE JOURNAL.

DIE FOUNDRY CHARGEHAND required in modern newly equipped foundry, St. Albans area, for mechanised production of gravity castings in aluminium and yellow metals. Good opportunity for experienced die caster able to teach new labour and control staff. Apply Box DF195, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

APPLICATIONS are invited for a vacancy for a male CHIEF ASSISTANT METALLURGIST, preferably age 30-40, with experience in Chemical Analysis, Physical Testing and Metallography. Knowledge of Physics (especially Optics), Machine Shop Practice, Heat Treatment of Steel and Instruments Design, an advantage. Works trained man with degree preferred. Apply in writing with particulars and salary required to THE PERSONNEL MANAGER, Ransomes Sims & Jefferies, Ltd., Orwell Works, Ipswich.

K. & L. STEELFOUNDERS AND ENGINEERS LIMITED, Letchworth, Herts, require a CHIEF METALLURGIST to head routine and development laboratories serving large scale foundry and engineering activities. The post is an important one and highly paid. The department is well equipped and has functional responsibilities in the production organisation. Applications are invited from experienced and qualified men who wish to join a team of enthusiastic executives in a progressive company. Applications (which would be treated in strict confidence) should be addressed to the MANAGING DIRECTOR.

FOUNDRY MANAGER required immediately for small light casting Foundry in East Midlands. Applicant must be keen, energetic and a good disciplinarian and be able to organise all stages from Patternmaking to Plate production. Age preferably 30 to 40. Excellent prospects for the right man. Apply giving full details of experience (in confidence) and salary required. — Box FM179, FOUNDRY TRADE JOURNAL.

REPRESENTATIVE, preferably with engineering background and connections in the London Area, required for Company producing investment castings. Reply with details of experience and salary required to P.I. CASTINGS (ALTRINCHAM) LTD., Atlantic Street, Altrincham, Cheshire.

FOUNDRY FOREMAN required for Foundry in East Suffolk producing up to 40 tons per week of high class grey iron and non-ferrous—including aluminium—light to medium weight castings. Hand and Machine Moulding. Applicants must have good technical knowledge, be thoroughly practical, capable of ensuring proper training of apprentices and trainees and used to control of men. Salary and bonus on output will be paid to successful applicant. Applications stating qualifications with copies of references, together with inclusive salary required, to Box FF185, FOUNDRY TRADE JOURNAL.

ASSISTANT FOUNDRY FOREMAN required for non-ferrous mechanised foundry in South-West Midlands. Pension scheme. Write, stating age, experience and salary required. Box AF188, FOUNDRY TRADE JOURNAL.